Proposal for Phase Two Site Investigation

Newton Creek and Hog Island Inlet Douglas County, Wisconsin

January 5, 2001

SHORT ELLIOTT HENDRICKSON INC
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ARCHITECTURE • ENGINEERING • ENVIRONMENTAL • TRANSPORTATION

January 5, 2001

RE: Proposal for Phase Two site Investigation
Newton Creek and Hog Island Inlet
Douglas County, Wisconsin
SEH No. P-WIDNR0103 10.00

David Behn - FN/1
Department of Natural Resources
101 S. Webster Street
PO Box 7921
Madison, WI 53707-7921

Dear David:

Short Elliott Hendrickson Inc.® (SEH) appreciates the opportunity to submit this proposal for the second phase of investigation of the Newton Creek System. As you are aware, SEH completed the first phase of this project for the Department in 2000. We feel our proposal meets the requirements of your Request for Proposal (dated December 8, 2000).

During the preparation of this proposal, SEH has obtained quotes from various subcontractors (Battelle, LSRI, Hart Crowser, EnChem, etc.) and estimated our level of effort necessary to meet the goals of this project. The costs we have presented represent our best estimate of the true costs. We believe that SEH has the best understanding of the true cost necessary to complete the scope. The costs are somewhat higher than our expectations due to the size and complexity of the scope of work. However, there may be options available to reduce the cost without substantially reducing the outcomes. We would appreciate the opportunity to meet with you and discuss these options in a noncompetitive setting.

Please review our proposal in light of these advantages. SEH is uniquely qualified to join the Departments' team on this important and complex project. If selected, we will provide superior technical and Client service in an objective and defendable manner.

Feel free to contact us to further discuss this proposal at (800) 472-5881. Thanks again for considering SEH.

Sincerely,

Mark J. Broses, P.E.
Project Manager/Associate

Cyrus W. Ingraham, P.E.
Principal

CWI/js/MJB
c: Jim Hosch
John Burnett

Enclosures: Proposal
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I. Introduction

The Wisconsin Department of Natural Resources (WDNR) has requested competitive proposals for the Phase Two Site Investigation of Newton Creek and Hog Island Inlet. The Request for Proposal (RFP) dated December 8, 2000 outlines the WDNR Scope of Work (WDNR SOW) and standard contract for this project. SEH recently completed the Phase One Investigation of Segments B and C of Newton Creek. The WDNR SOW was based on the outcome of those efforts.

The WDNR SOW outlines several tasks to be completed during the Phase Two Site Investigation. SEH has organized these efforts into 22 tasks as outlined in Section III Scope of Work of this proposal. We have responded directly to each item requested in the WDNR SOW. In addition, we have provided options for certain tasks where costs may be reduced or where outcomes may be enhanced. Accordingly, the estimated costs outlined in Section VI of this proposal are given for the WDNR SOW and for the options.

SEH has significant historical knowledge related to technical and responsible party issues so important to a successful resolution of environmental concerns at the site. We have invested significant efforts reviewing historical files, developing investigation strategies with the Department, and have successfully completed the first phase of this project.

For continuity, SEH brings the same nationally recognized team of experts to this project as the first phase. These experts will be available to provide expert testimony services if necessary in the future.

We intend to contract with Mr. Alan Uhler Ph.D. of Battelle Memorial Institute for the forensic analysis and wetlands treatability studies. Mr. Alan Uhler Ph.D. of Battelle was instrumental in fingerprinting hydrocarbons during the first phase of the project. The results of this analysis indicated that the primary source of contamination is related to crude oil or refinery wastewater. Further analysis is required during the second phase to properly address responsible party issues.

Hart Crowser will join the team again for the second phase to assist in the cesium dating and provide further consultation regarding the forensic analysis to be completed by Battelle.

LSRI will continue providing toxicity studies and macroinvertabrate studies as necessary to complete the Ecological Risk Assessment for the site. LSRI has been involved in the Newton Creek project for several years.

Decision Risk Management will be retained to assist in the completion of the Human Health Risk Assessment. Mr. David Lincoln Ph.D. (principal of DRM) has reviewed the previous Risk Assessment and will provide input on the exposure of recreational users to the surface waters.

II. Understanding of the Project

The following subsections describe the SEH team's understanding of the project history, current project goals, and our technical approach to meet the WDNR goals for the work under this contract.

Project History

Newton Creek runs approximately 1.5 miles from the Newton Creek Impoundment to the Hog Island Inlet (embayment to Lake Superior). The creek and its contiguous wetlands encompass approximately 60 acres. WDNR classifies the creek as a limited forage fish community.

The creek meanders through residential, commercial and industrial areas in the City of Superior. For approximately 50 years, Murphy Oil USA Inc. has utilized the creek impoundment as a discharge point for wastewater effluent. Other industries in the vicinity of the creek include the Lakehead Pipeline bulk petroleum storage facility and the Dome Petroleum (subsidiary of Amoco) natural gas storage and distribution facility.

Without the wastewater effluent, Newton Creek's flow would be limited to runoff from the watershed associated with precipitation events and spring thaw. Summertime baseflows are estimated to be approximately 1 cubic foot per second. Overflow culverts installed at heights greater than 6 ft above the baseflow level are necessary for high flow events such as the spring thaw. Based on this information it is evident that Newton Creek sediments may be subject to high energy scouring/resuspension on an annual or more frequent basis. Sediments collected from the creek system by the WDNR in 1990 indicated elevated levels of PAHs, oil & grease, and a variety of metals.

In 1997, Murphy Oil removed contaminated sediments from the impoundment at the upper end of the stream, and from Segment A of Newton Creek. Contaminated materials were placed in a containment facility on Murphy Oil property. In March 1998, the WDNR and the City of Superior agreed to jointly remediate and improve the Newton Creek corridor. In the summer of 1998, the WDNR installed sediment traps and contracted a topographical survey of the Newton Creek system.

SEH performed extensive investigation work on Segments B and C of the Newton Creek system during 1999 and 2000. SEH's activities included: performance of an environmental investigation of soil, sediment, groundwater, and surface water; performance of an ecological risk assessment (ERA); performance of a human health risk assessment (HHRA); and fingerprinting of PAH compounds within these segments of the Newton Creek system.

The results of the historic activities and studies performed to-date indicate:

- Sediment in the creek bed and flood plain from the Murphy refinery to Hog Island Inlet have been impacted by Diesel Range Organic (DRO) compounds, polycyclic aromatic hydrocarbons (PAH), volatile organic compounds (VOC), oil and grease, ammonia, lead, and other heavy metals;

- The primary source of contamination in Newton Creek is believed to be crude oil or refinery wastewater. Releases from local industry, urban runoff, storm water, and combined sewer overflow may also be contributory sources. Mass loading allocations from the potential sources has not been estimated to date;
- Potential negative ecological impacts may have occurred in Segments B and C of Newton Creek based on the results of SEH's 2000 Ecological Risk Assessment;
- The surface waters within Segment B of the Newton Creek system exceeded site specific limits (carcinogenic) based on SEH's 2000 Human Health Risk Assessment.

Current Project Goals

The WDNR is initiating this project to accomplish several goals for the Newton Creek system. The overall project may include evaluation and potential remediation of part or all of the Newton Creek and Hog Island inlet system. A phased approach was selected by the WDNR starting at the upstream segments of Newton Creek. Murphy Oil has completed investigative and remedial efforts in the impoundment and Segment A of Newton Creek in 1998. SEH completed investigation of Segments B and C on Newton Creek during 1999 and 2000. The current investigation will include Segments D through L of Newton Creek and Hog Island Inlet. The WDNR has stated several goals of this investigation in their RFP and subsequent meeting and discussion. Those goals include:

- Document the degree and extent of sediment and flood plain soils contamination along Segments D through L, and Hog Island Inlet and its associated isthmus;
- Define the stratigraphic and hydraulic conditions or characteristics in Hog Island Inlet and its associated isthmus, Newton Creek and its floodplain, and impacts to Lake Superior;
- Document the extent of contamination, impacts to the ecology, potential and real adverse human health effects, and various creek and inlet conditions;
- Determine if Newton Creek or Hog Island Inlet will become recontaminated following remedial activities;
- Determine contaminant loading and current source(s) of contaminants to the Newton Creek system;
- Determine maximum contaminant loading for the Newton Creek and Hog Island Inlet without adverse impacts to the ecology of the stream or to human health; and

- Develop an alternatives array of appropriate remedial actions, prepare a cost benefit analysis, and recommend appropriate remedial actions to address the contamination associated with the Newton Creek/Hog Island Inlet system.

Technical Approach

SEH has developed an approach to meet these goals and provide the WDNR with a comprehensive assessment of Segments A through L of Newton Creek, Hog Island Inlet, and associated isthmus. It is SEH's intent to obtain data from Segments D through L of Newton Creek, Hog Island Inlet and associated isthmus, and utilize existing data from Segments A through C to complete the study. Our specific approach is outlined in the Scope of Work section of this proposal (Section III). Our scope of work includes the specific efforts outlined in the RFP.

III. Scope of Work

The following scope of work has been developed to meet the requirements of the Wisconsin Department of Natural Resources request for proposal dated December 8, 2000. The scope also reflects our discussions with Mr. Jim Hosch and observations of the site made during our pre-bid meeting on December 19, 2000. The scope of work will be performed in conformance with the provisions of NR 500, 600, and 700 series, Wis. Adm. Code.

The following 22 tasks will be completed by SEH to provide the services necessary to complete the Scope of Work (WDNR SOW) included as an attachment to the RFP in Appendix A.

Task 1: Historical Review

SEH will perform an historical review of the Newton Creek vicinity prior to beginning field investigation activities. The historical review will include past and present land ownership, past and present land use features, fill areas, waste disposal areas, underground storage tanks, and spill areas in the study area. In addition, SEH will review existing WDNR project file data, including existing reports, logs, surveys, analytical data, local news articles, and other relevant project information generated by others. Upon approval by the WDNR, SEH will interview 10 to 15 individuals familiar with the environmental history of Newton Creek and Hog Island Inlet. The results of the historical review will be utilized to aid in formulating a work plan for site investigation.

Task 2: Work Plan

Upon completion of historical review activities, SEH will prepare a Work Plan outlining the detailed field activities required to complete the site investigation of the Newton Creek system. The work plan will be prepared in general accordance with ch. NR 716.07 Wis. Adm. Code, and will include the following sections:

- General site information;
- Results of the Historical Review
- A Site Investigation Plan describing the details of the proposed field activities;
- A Field Sampling Plan describing the sampling design and analytical methodology;
- A Quality Assurance Plan describing quality assurance/quality control procedures to be implemented during sample collection, handling, shipment, and analysis;
- A Site Safety Plan describing site specific measures to be taken to maintain health and safety during performance of field activities in accordance with OSHA standards;

- An Investigative Waste Management Plan to address handling of investigative wastes generated during the site investigation, and;
- A Work Schedule for conducting the investigation.

A draft Work Plan will be prepared by SEH for WDNR review and comment. The draft Work Plan will be submitted in duplicate to the Project Manager in Superior, one copy to the Bureau of Watershed Management in Madison, and one copy to the Bureau of Remediation and Redevelopment in Madison. A final Work Plan will be prepared and submitted in like manner to WDNR within fourteen days of receipt of comments on the draft Work Plan.

Task 3: Site Survey

A site survey will be performed to develop site plans to be used in the project report. The survey will identify the location of utilities, property boundaries, sampling locations and associated ground surface elevations, and site topography within the area of investigation. The survey data will be compiled into individual GIS layers for segments A through L and Hog Island Inlet. Where applicable, reliable sources of survey information (e.g., City of Superior's GIS database, existing SEH survey data) will be used.

The Continuously Operating Reference Station (CORS) network coordinated by the National Geodetic Survey, NOAA, is a group of GPS reference stations which provide code range and carrier phase data to users in support of post-processing applications. One of these reference stations, WIS 1, is located in very close proximity to the Newton Creek site. SEH can apply CORS data to position points at which GPS data have been collected. This enables positioning accuracy that approaches a few centimeters relative to the National Spatial Reference System, both horizontally and vertically.

The site survey task will include review of WDNR information pertaining to endangered or threatened species indigenous to the area. A one-mile radius around the area of investigation will be included in this ecological survey.

Task 4: Geologic Borings

SEH proposes to initially perform 78 soil borings in the floodplain of Segments D through L of Newton Creek. The soil borings will be located on 26 transects spaced perpendicular to the channel of Newton Creek. Placement of transects will be based low energy areas identified in the hydraulic analysis, existing field conditions and other relevant data obtained during the historical review. In addition, 20 soil borings will be performed along the wetland isthmus and shoreline at Hog Island Inlet. Up to 12 additional borings may be utilized to further define degree and extent of contamination identified in the initial boring locations along Newton Creek and Hog Island Inlet.

The initial 98 soil borings will most likely be installed using an all-terrain vehicle mounted hydraulic probe rig. Undisturbed soil samples will be collected continuously from ground surface to an approximate depth of 12 feet using a Macrocore (TM) sampler equipped with sample-dedicated clear polyethylene liners. The soil boring installation will be directed and overseen by an SEH hydrogeologist (NR 712.03(1)) or scientist (NR 712.03(3)). The SEH field representative will observe soil samples and prepare soil boring logs (WDNR Form 4400-122) for each soil boring using the Unified Soil Classification System (USCS).

Representative soil samples will be collected from each sample interval for possible laboratory analysis. If layering of contaminants is observed in the samples, these layers will be segregated for potential discrete analysis of the impacted layers. Upon completion of soil sampling activities at a given location, the open borehole will be abandoned in accordance with NR 141 Wis. Adm. Code requirements. Borehole abandonment forms (WDNR Form 3300-5B) will be completed for each abandoned soil boring.

If additional data is required to delineate site contamination after completion of the initial 98 soil borings, up to additional borings may be performed in areas determined by the initial results. These borings will be performed using a motorized hand auger equipped with hollow-stem augers. Soil samples will be collected continuously at one-foot intervals from ground surface to a depth of approximately eight feet. The soil samples will be collected using a core sampler equipped with sample dedicated polyethylene liners. Soil samples will be collected for possible laboratory analysis and boreholes will be abandoned as described above.

Task 5: Sediment Sampling

A total of 52 sediment samples (two at each transect location) will be collected from the bottom of Newton Creek during the site investigation. The sediment samples will be located at the approximate center of the creek along the soil boring transect lines. One sample will be collected from the bioactive zone and one sample will be collected from the vertical extent of contamination at each transect location. In addition, a total of ten sediment samples will be selected from Segments D through L of Newton Creek for particle size analysis.

Sediment samples will be collected on a grid pattern at 40 locations within Hog Island Inlet. Two sediment samples will be collected for analysis from each sampling location (one from the bioactive zone and one from the vertical extent of contamination). In addition, a total of 16 sediment samples will be selected from Hog Island Inlet for particle size analysis.

SEH will use a Macrocore® sampler to collect the sediment samples. The sampler is equipped with sample-dedicated clear polyethylene liners and sample catchers. The clear liners allow observation of samples for layers of contaminants, etc. prior to disturbance of the samples. If contaminated layers are observed, they will be segregated for potential discrete layer analysis.

The sampler is advanced and withdrawn from each location mechanically using a slide hammer. Sediment samples will be collected continuously through sediment deposits into the underlying natural clay soils. Soil boring logs will be completed by the SEH field representative describing the stratigraphy at each sediment sampling location as well as observations of potential contamination (e.g., staining, NAPL layers, odors).

A total of ten sediment traps will be placed within the area of investigation. Six of the traps will be located within Newton Creek, three of the traps will be placed in Hog Island Inlet, and one trap will be placed in Superior Bay. The traps will be periodically monitored for sediment accumulation rates as well as for sediment sampling. Three sampling events are anticipated for the sediment traps. Accumulation of sediment will be measured and layers of contaminated sediment will be measured and recorded following significant precipitation events. The sediment will be visually classified for soil type and observations of visually apparent contamination will be documented at each trap during each sampling event.

Task 6: Water Column Samples

A total of 40 water column samples will be collected from Newton Creek/Hog Island Inlet to define baseline water quality conditions, potential pathways of contaminant migration, and potential contaminant sources within the study area. The water column sampling will be performed at 20 locations during two sampling events. One sampling event will occur immediately following a heavy rainfall event, and the other sampling event will occur during a heavy snow melt event.

As part of the Human Health Risk Assessment (HHRA), 12 additional water column samples will be collected from the area of investigation. The samples will be collected from the water column after the underlying sediments have been disturbed in an effort to simulate realistic exposures for activities such as wading.

Prior to sampling, staff gauges will be installed at the 20 locations to be utilized for water column sampling during the investigation. Prior to sampling, the water level will be recorded at each sampling location. Water samples will then be collected from midstream at each location using an Alpha (TM) horizontal sampler. The water samples will be monitored in the field for temperature, dissolved oxygen content, field conductivity, and pH. Samples will then be placed in laboratory-clean bottles and preserved as necessary for shipment to the analytical laboratory.

Task 7: Surface Water Automatic Sampler/Monitors

SEH will install automatic sampler/monitors at three locations in Newton Creek. The automatic sampler systems will include the following features:

- Aromatic hydrocarbon monitor
- Temperature monitor
- Conductivity
- pH
- Telephonic data transmission and alarm
- Monitoring equipment shelter
- Concentration triggered sampling capability
- Telephonic sample triggering capability

The automatic sampler systems will be housed in heated locking storage buildings. The monitors will draw water continuously at a flow rate of 2 to 3 gallons per minute from the flow of Newton Creek using a mechanical diaphragm pump housed within the structure. The water will pumped through a bag filter to removed leaves and other suspended detritus. The flow will be continuously monitored for concentrations of aromatic hydrocarbons using a Turner Designs TD-4100 online monitor. At automatic triggering concentrations, samples will be collected from the flow by a self-contained automatic sampler. Remote probes will also be installed at the water intake point for continuous monitoring of conductivity, pH, and temperature which are connected to a programmable logic controller (PLC). The PLC will be capable of local operator interface, and will be capable of communicating with a modem/autodialer. The system will monitor operation of the pump, data logger, hydrocarbon monitor, and control auto sampler. The PLC will allow remote viewing and editing of system set points, allowing sample collection triggering from a remote location.

Initially, one automatic sampler will be deployed to the site to determine and correct any design or operation issues related to the systems. Upon correction of any design issues, the three automatic samplers will be deployed to the site and maintained for a four month rental period. Upon completion of the four-month rental, WDNR will have the option to purchase the automatic monitoring systems via a separate purchase order.

If costs for the above system design are considered to be too high, SEH suggests the following alternate task be performed to meet the intent of this requested scope item:

Alternate Option 7A: Surface Water Automatic Sampler/Monitor without Telemetry

Preliminary design research by SEH indicates that the costs to include telephonic data transmission for the systems will be significant. Deletion of

the telemetry component would reduce equipment space needs and costs associated with instrumentation and service.

Task 8: Monitoring Wells

Upon completion of the initial borings at the site and review of initial soil analytical results, SEH will install six water table observation wells at the site. The locations of the wells will be selected based on the initial field observations and analytical results. The locations most likely to be impacted will be instrumented with wells. The wells will be installed using an ATV mounted rotary drill rig and hollow-stem augers. The wells will be installed and developed in general accordance with ch. NR 141 Wis. Adm. Code requirements. A WDNR Well Construction Form (4400-113A) and Monitoring Well Development Form (4400-113B) will be completed for each well installed on the site. In addition, a Groundwater Monitoring Well Information Form (4400-89) will be completed for the project. If accessibility or other site constraints require deviation from Ch. NR 141 requirements, a variance application will be submitted to WDNR and approved prior to proceeding with well installation activities.

Two rounds of groundwater samples will be collected from the six wells. The groundwater samples will be collected using a peristaltic pump and disposable polyethylene tubing. The samples will be preserved and filtered as necessary in the field, labeled, and chilled to 4 degrees C for transport to the analytical laboratory.

Task 9: Bench Scale Study

A bench scale study will be conducted to evaluate the feasibility of using wetland treatment as a remedial option on the Newton Creek system. The conceptual wetland treatment cell will utilize both a surface water flow component and a subsurface flow component to allow treatment of both normal flow conditions and infrequent high flow conditions. SEH will collaborate with wetland remediation researchers at Battelle to design and perform the study. SEH has prepared a preliminary design of the study, however, further research should be completed to refine the design. SEH and Battelle will provide a brief work plan presenting the final design of the study prior to construction.

The preliminary design proposes to conduct the bench scale analysis of a manmade wetland treatment cell in a wet laboratory using representative sediments collected from the Newton Creek system. The sediments will be placed in an aquaculture treatment cell to evaluate sediment resuspension and settling characteristics during normal and flood conditions. In addition, the bench scale analysis will assess plant uptake of contaminants and adsorption of contaminants within the system. The substrate within the treatment cell will be comprised of a pea gravel drainage layer at the base, overlain by a layer of filter sand, which is in turn overlain by a representative layer of soils collected from the area of investigation. The preliminary design proposes

using common reed, Black Willow and/or Bullrush in the rooting zone of the treatment cell. Other species may be substituted, pending further research. Reed canary grass and cattail are also proposed for use to simulate invasion of indigenous plants during operation of the system. The temperature and light conditions will be controlled during the bench scale study to simulate actual conditions during the growing season.

The following elements will be evaluated during the bench scale study:

- Plant uptake of contaminants,
- Water velocity,
- Water depth, flood duration, and
- Desorption of contaminants to the water column.

If the results of the Bench Scale study indicate wetland treatment could be a viable remedial technology for treatment of contaminants within the Newton Creek system, SEH will provide recommendations for a field study of this technology.

Task 10: Ecological Risk Assessment (ERA)

SEH will perform an ecological risk assessment (ERA) of six select locations in Segments D through L of Newton Creek, Hog Island Inlet, and Superior Bay using the triad approach and other weight of evidence. It is anticipated that a similar approach to that used by SEH for segments B and C of Newton Creek will be utilized during this ERA. Due to the large variation in habitat, flow characteristics, and contaminant concentrations in the New Creek/Hog Island system, a minimum of six test sites are recommended for this study. The six locations will be used for UV light study, macroinvertebrate analysis, and collection of sediment for use in toxicity tests.

The SEH Team will review the historical and recent ecological data and assessment to determine if data gaps exist. SEH will review applicable published sediment quality objectives and compare those values to the analytical results from the Newton Creek system. SEH will then compare historical ERA data as well as data generated during this phase of investigation to make recommendations for clean-up goals for site sediments, soils and surface water.

A study of UV incidental light will be conducted by SEH at six locations within the Newton Creek/Hog Island Inlet system. Measurements of UV light will be conducted at the surface, mid-depth and bottom depths at each location. The incidental UV measurements will be conducted during clear weather conditions near mid-day. The data obtained during the UV incidental light study will be utilized during subsequent UV toxicity studies.

Toxicity studies will be completed using target organisms exposed to bulk sediment and elutriate utilizing UV light. The studies will also be conducted without UV light exposure to document the effects of this variable. The organisms will be selected for the toxicity studies will include *Hyalella*

Azteca, Lumbriculus variegatis, and *Chironomus tentans.* Additional organisms may be considered based on discussions with WDNR and review of the aquatic macroinvertebrate analysis results. Bucket samples of sediment will be collected by SEH from 6 locations and homogenized by LSRI for use in the toxicity studies.

A macroinvertebrate study will be conducted at 6 select locations (coinciding with the locations used during the UV incidental light study) of Newton Creek, Hog Island Inlet, and Superior Bay. Sediment core samples will be collected and observed for abundance and diversity of benthic macroinvertebrates within the area of investigation.

SEH suggests the following related optional task be performed in addition to the requested scope item:

Additional Option 10A: Chemical Analyses of Homogenized Bulk Sediments

Chemical analysis (PVOC, Expanded PAH, AVS/SEM Metals, and TOC) of the homogenized sediment samples utilized for the toxicity tests is recommended to optimize correlation of the test results to chemical concentrations, as part of the triad analysis. The recommended chemical analyses were not included in the RFP.

Additional Option 10B: Artificial Substrate and Activity Traps

Following macroinvertebrate study of the core samples from the six locations, it may be beneficial to install artificial substrate and activity traps to further identify native benthic fauna frequenting the sites.

Task 11: Human Health Risk Assessment

SEH will expand the existing Human Health Risk Assessment (HHRA) for Segments B and C of Newton Creek to include present and future uses of Segments D through L of the Newton Creek drainage basin and Hog Island Inlet. The purpose of a HHRA is to evaluate the potential existing and future threats to public health in the absence of remedial action, and to determine the extent of future remedial action necessary to promote public health. The HHRA will be conducted in general accordance with the Wisconsin Administrative Code, WDNR guidelines and the EPA Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Parts A and B.

The HHRA will consist of the following four components:

Data Collection and Evaluation - involves the gathering and analyzing of relevant site data. SEH will use analytical and field data collected during the proposed investigation and characterization of Segments D through L of the Newton Creek drainage basin and Hog Island Inlet. Chemicals of concern

will then be identified in order to determine the human health risk associated with these segments.

Exposure Evaluation - pathways, magnitude, frequency and duration of potential exposure are evaluated. Site usage and local area demographics will be researched and reported. Reasonable maximum estimates of exposure will be developed for both current and future land uses. Exposed populations, potential pathways of exposure, and exposure uptake concentrations will be identified for the potential contaminants of concern. Assumptions used in the exposure model will be consistent with ch. NR 720 Wis. Admin. Code and EPA methodology unless directed otherwise by the WDNR.

Toxicity Assessment - considers available evidence on the potential for contaminants to cause adverse health effects. USEPA has performed the toxicity assessment step for many chemicals. The primary sources of toxicity data are the Integrated Risk Information System and Health Effects Summary Tables. These and any readily available sources of toxicity information will be used in this HHRA.

Risk Characterization - summarizes the exposure and toxicity assessment results to characterize site risk. Pertinent segments of the previously completed HHRAs will be reviewed and amended as necessary, taking into consideration advances in assessment techniques and recent data collected. This component estimates the excess carcinogenic risk as well as non-carcinogenic effects associated with potential exposure to site contaminants.

SEH suggests the following related optional tasks be performed in addition to the requested scope item:

Additional Option 11A: Background Sampling for HHRA

Evaluation of background concentration is an important component of the HHRA chemical screening. In addition to the samples collected as part of this proposed Newton Creek investigation, SEH recommends collection of samples from a reference site to serve as a background. The background samples (3 anticipated of various media) would be analyzed for petroleum volatile organic compounds (PVOC), polycyclic aromatic hydrocarbons (PAHs), total cadmium (Cd), total chromium (Cr), hexavalent Cr, total lead (Pb), total mercury (Hg), AVS/SEM metals.

Additional Option 11B: Surface Soil Sampling for HHRA

In addition to the samples collected as part of this proposed Newton Creek investigation, SEH recommends collection of 30 surface soil samples from the 0 to 8 inch depth interval to evaluate the surface exposure route for the HHRA. One surface soil sample are recommended to be collected from each of the 26 transects and from 4 locations around Hog Island. The location of the surface soil samples will be determined by examining the results of the subsurface soil results and choosing the location that appears most contaminated along each transect. The surface soil samples selected would be submitted to the laboratory for analysis of PVOCs, PAHs, total Cd, total

Cr, hexavalent Cr, total Pb, total Hg, AVS/SEM metals, and total organic carbon (TOC).

Task 12: Define Sediment Quality Objectives

The SEH team will assist the WDNR in defining the cleanup goals for the Newton Creek/ Hog Island Inlet system using the results of the previous Tasks. The cleanup goals will be based on existing WDNR guidance and discussions with the WDNR Project Manager and Technical contacts. Sediment quality objectives will be developed to address both ecological and human health risks.

Task 13: Soils and Sediment Chemical Analyses

Soil Samples: A minimum of one soil sample from each soil boring as described under Task 4 will be selected for laboratory analysis. Samples will be observed in the field for indications of contamination (e.g., staining, odors, sheening) and screened in the field with a flame ionization detector (FID). The sample exhibiting the most contamination based on field screening and observations in each boring will be submitted for PAH analysis.

The most visibly contaminated soil sample from each transect (26) across Newton Creek and from four locations around Hog Island will also be submitted to the laboratory for analysis of PVOCs, total Cd, total Cr, hexavalent Cr, total Pb, total Hg, and AVS/SEM metals. Twelve additional soil samples may be selected for analysis to determine the vertical extent of contamination.

Duplicate soil samples will also be submitted for 10% of the samples to meet quality assurance objectives.

Sediment Samples: Two sediment samples (one from the bioactive zone and one from the vertical extent of contamination) will be selected for laboratory analysis from each sediment sampling location in the creek (26 transects – 52 samples total). The sediment samples will be located at the approximate center of the creek along the soil boring transect lines. Two sediment samples will also be collected on a grid pattern at 40 locations within Hog Island Inlet (80 samples total). A total of ten sediment traps will be placed within the area of investigation as described under Task 5. Sediment trap sampling will occur on three events (30 samples total).

All of the sediment samples will be submitted to the laboratory for analysis of PAHs.

Twenty-six (26) samples from the creek, ten sediment core samples from the bioactive zone and ten deeper sediment core samples will also be submitted for PVOC, total Cd, total Cr, hexavalent Cr, total Pb, total Hg, and AVS/SEM metals. Sediment trap samples will also be submitted for the full range of parameters.

Duplicate sediment samples will also be submitted for 10% of the samples to meet quality assurance objectives.

SEH suggests the following related optional tasks be performed in addition to the requested scope item:

Additional Option 13A: Total Organic Carbon Sampling

SEH recommends that TOC analysis be conducted for each of the samples in order to normalize concentrations to organic carbon content.

Additional Option 13B: Complete Chemical Analysis all Samples

SEH did not assume that the all of the requested chemical analyses would be conducted for every sample. SEH does not recommend this approach either, but has included the additional costs to run the full scan as an option if this was the WDNR's intent.

Additional Option 13C: Complete VOC Analysis

SEH assumed that petroleum VOCs (PVOCs) would satisfy the VOC analysis, as only PVOC's have been identified at the site in the past. SEH does not recommend analyzing for the complete VOC list, but has included the additional costs to run the full VOC scan as an option if this was the WDNR's intent.

Task 14: Surface Water and Groundwater Chemical Analyses

Surface Water Samples: Surface water samples will be collected from a total of 32 sample locations as described in Task 6. The water column sampling will be performed at 20 locations during two sampling events. Prior to sampling, staff gauges will be installed at the 20 locations to be utilized for water column sampling during the investigation. Twelve additional disturbed water column samples will be collected from the area of investigation for the HHRA analyses. Prior to surface water sampling, the water level will be recorded at each sampling location.

The water samples will be monitored in the field for temperature, dissolved oxygen content, field conductivity, and pH. Samples will then be placed in laboratory-clean bottles, labeled as to date and time of sample collection, and preserved as necessary for shipment to the analytical laboratory.

Discrete water samples will be collected at each water column sampling location. The water column samples will be submitted to the laboratory for analysis of PAH, total Cd, total Cr, hexavalent Cr, total Pb, and total Hg.

Sampling devices will be set at each of three automatic surface water sampling device locations for collection of PAH, total Cd, total Cr, hexavalent Cr, total Pb, total Hg. A total of twelve samples (four separate sampling events) will be collected using the automatic sampling devices.

Groundwater Samples: Groundwater samples will be collected from each of six new water table observation wells. One round of groundwater samples will be collected from the six wells. In the event that private groundwater wells are identified during the historical review, samples will be collected during the sampling event at the private wells also. Water table elevation measurements will be recorded for each groundwater observation well or private well sampled at each sampling event. Water table elevation measurements will be measured to 0.01 foot accuracy.

The groundwater samples will be collected using a peristaltic pump and disposable polyethylene tubing. The samples will be preserved and filtered as necessary in the field, labeled, and chilled to 4 degrees C for transport to a Wisconsin certified analytical laboratory. The samples will be analyzed for PVOC, PAH, Cr, total Cd, hexavalent Cr, Pb, Hg.

SEH suggests the following related optional tasks be performed in addition to the requested scope item:

Additional Option 14A: TOC, TSS, and TDS Analyses

SEH recommends that TOC, TSS, and TDS analysis be conducted for each of the water samples in order to normalize concentrations to organic carbon content and compare to suspended and dissolved solids concentrations.

Additional Option 14B: Complete VOC Analysis

SEH assumed that petroleum VOCs (PVOCs) would satisfy the VOC analysis, as only PVOC's have been identified at the site in the past. SEH does not recommend analyzing for the complete VOC list, but has included the additional costs to run the full VOC scan as an option if this was the WDNR's intent.

Task 15: Forensic Analysis

SEH will collect 20 samples from the various matrices onsite, and submit to Batttelle for analysis of extended list of PAHs, alkyl substitutes, and biomarkers. Battelle will subsequently provide a written and graphical analysis of the current and previous 2000 results to determine if those PAHs are associated with specific distillate, crude oil, or waste fractions of petroleum.

Crude oils, middle-and higher distillates, and residual/waste petroleum are usually enriched in polycyclic aromatic hydrocarbons (PAH). Two through

6-ring PAH, and importantly their C_1 to C_4 alkyl homologues, plus diagnostic heteroatomic polycyclic aromatic hydrocarbons such as sulfur-containing thiophenes and dibenzothiophenes, are collectively key diagnostic parameters that allow the forensic chemist to identify and distinguish among hydrocarbon assemblages. Unfortunately, standard EPA methods of analysis such as EPA 8270B or EPA 8310 measure only the presence of 16 parent, unsubstituted PAH compounds. These unsubstituted PAH usually comprise only a small percentage of total PAH found in petroleum. In order to accurately identify PAH assemblages and to distinguish amongst potential sources of PAH-enriched materials, it is imperative that, for environmental forensic purposes, an extended list of PAH be measured in the samples.

We propose to utilize a gas chromatography with mass spectrometry (GC/MS) method that is an adaptation of EPA 8270B to measure the presence of diagnostic PAH compounds (parent PAH, alkyl homologues, selected individual PAH isomers) listed in Table 1. Sample extracts, prepared as described above, will be analyzed by GC/MS with the instrument operated in the selected ion monitoring (SIM) mode. Primary and secondary ions for each parent PAH and alkylated homologue will be monitored and quantified relative to a 5-point initial calibration curve. The result of each sample analysis will be compiled in tabulated lists of the concentration of diagnostic PAH, reported in ug/Kg dry weight (sediment/soil) and accompanied by histograms depicting the relative concentration of the PAH. These can be compared visually or numerically amongst samples and against PAH distributions of reference petroleum-products or other standards to determine the nature of in-place hydrocarbon contamination.

Task 16: Literature Search - Sediment Dating

SEH will subcontract Hart Crowser to perform a literature search of potential techniques to be used in determining the date of deposition of site sediment samples. The use of Cesium dating as well as other potential methods for dating holocene deposits (e.g., Tritium dating) will be included in the literature search. A recommendation will be made to WDNR regarding the feasibility of dating site sediments. If the recommendation is that sediment dating is feasible, SEH will provide a proposal to WDNR for dating of sediments under a separate contract.

Task 17: Report – Investigation of Newton Creek, Hog Island Inlet, and Superior Bay

Upon completion of field activities, laboratory analysis, and hydraulic analysis, SEH will prepare a site investigation report in accordance with chs. NR 712.07 and 716.13, Wis. Adm. Code, along with guidelines provided in the most recent version of "Guidance for Conducting Environmental Response Actions," WDNR PUBL SW-157-92. The report will summarize existing site data, evaluate data generated during investigation of Segments D

through L and Hog Island Inlet, and provide a detailed review of potential remedial action options.

Analytical results will be summarized in tabular form, with complete analytical packages provided in the report appendices. Soil boring logs and borehole abandonment forms will be provided for each soil boring. Soil boring logs will also be prepared for each sediment sampling location. Project plan sheets, geologic cross sections of each transect, and contaminant concentration maps will be presented on a series of 24" x 36" drawings. Reduced (11" x 17") versions of the drawings will be incorporated into the bound copies of the report.

Task 18: Report – Human Health Risk Assessment

Upon completion of the HHRA, the risk findings will be presented in a Risk Characterization Report. The report will summarize the process and findings of the four HHRA components. The report will quantify both carcinogenic risks as well as non-carcinogenic effects associated with present and future potential exposure to site contaminants. Land usage of Segments D through L of the Newton Creek drainage basin and Hog Island Inlet will be presented along with populations at risk and exposure scenarios. Risks will be combined across appropriate pathways. The report will also consider uncertainty associated with the HHRA findings. A comparison to the findings of previous HHRA will be included in the risk report.

Task 19: Report – Ecological Risk Assessment

Upon completion of the ERA activities, the risk findings will be presented in a Risk Characterization Report. The report will summarize the process and findings of the ERA components and present the weight of evidence analysis. The report will also consider uncertainty associated with the ERA findings. A comparison to the findings of previous ERA will be included in the risk report. Sediment quality objectives will be summarized herein as related to the ERA.

Task 20: Report – Bench Scale Treatability Study

The bench scale study report will include a detailed description of the methods used and results obtained from the bench scale study. The results of the bench scale study will be reviewed in detail for both low flow and flood conditions. Recommendations will be made regarding applicability of wetland treatment for the Newton Creek system based on the results of the bench scale study.

Task 21: Report – Remedial Action Options Evaluation and Recommendations

The remedial action options - feasibility study (RAOFS) report will include review of potential remedial options to address contamination within the area of investigation. A cost benefit analysis comparing the cost effectiveness of each alternative will be provided, or a discussion of additional study required to complete the RAOFS.

Task 22: Progress Reports, Project Management, and Public Meetings

SEH will provide the WDNR with monthly progress reports detailing activities completed to-date and scheduled activities for the coming month. The monthly progress reports will provide percent complete for each of the tasks described in this proposal and expenditures broken out per task. Project management will include maintaining lines of communication between WDNR, SEH, and the subconsultants comprising the project team. SEH expects two project meetings will occur between WDNR and SEH during the project to discuss findings and potential recommendations for the site. Additionally, preparation for three public meetings is included in this task.

IV. Project Team

Short Elliott Hendrickson Inc, Battelle Memorial Institute, Hart Crowser, Inc., and Lake Superior Research Institute have integrated their technical capabilities to form the project team for the Newton Creek project. The capabilities and experience of this project team will provide the WDNR with the unique blend of state of the art technical expertise, regional presence, and knowledge of local conditions required to bring this project to successful completion. The following paragraphs describe the capabilities and project responsibilities of each firm comprising the project team.

Short Elliott Hendrickson Inc.

SEH will serve as the lead consultant on the Newton Creek project team. SEH has been providing engineering services in the upper Midwest for over 70 years. Our staff of 50 environmental professionals located within three hours of the project site provide extensive capabilities on investigation and remediation projects. In addition, the multidisciplined nature of SEH provides in-house expertise in a variety of related areas such as GIS, survey, water resources, hydraulics, and shore protection design.

SEH will manage the Newton Creek project from our office in Chippewa Falls, Wisconsin. Staff from SEH's Chippewa Falls, Duluth, and St. Paul offices will provide the field personnel for performance of the various tasks required to complete the field investigation. The key personnel provided to the Newton Creek project by SEH will include a project manager, senior hydrogeologists, remediation engineers, hydraulics engineers, risk assessors, health and safety coordinator, and environmental scientists. In addition, SEH's staff of highly qualified environmental technicians, GIS Specialists, CADD operators, word processors, and surveyors will be involved in completion of the project.

Battelle Memorial Institute

Battelle Memorial Institute of Duxbury, Mass (Battelle) will join the SEH Team to provide expert consultation and analysis for during this phase of the project. Battelle is a nonprofit research institute with a mission to assist government and private organizations with technical and scientific research and applications. Battelle currently has a staff of approximately 7500 individuals located in offices throughout the world. Battelle assisted with the surface water fingerprinting and expanded hydrocarbon analysis during the investigation of Segments B and C. Their conclusions indicated that the likely source of contamination in Newton Creek is from refinery wastewater effluent. Battelle will continue to provide specialty laboratory analysis and forensic chemistry for the second phase of the Newton Creek Investigation. In addition to the chemical and forensic analysis, Battelle will also provide consultation during the development of the bench-scale study work plan. Battelle sponsors and organizes several international environmental conferences including *Wetlands and Remediation, an International Conference* which is held every two years. Their experience in research and

implementation of wetland-related remediation and treatment systems will be a valuable asset to the SEH Team.

Hart Crowser, Inc.

Hart Crowser is a 200 person specialty environmental consulting firm with significant experience in all aspects of sediment assessment and remediation. They have completed the largest remediation of contaminated sediment ever undertaken by USEPA mandate. The remediation included over 2,000,000 cubic yards of contaminated sediment. Hart Crowser will provide technical assistance from our Chicago office, with support being provided by our staff in Seattle and Jersey City as needed. Hart Crowser will assist in the research of the cesium dating of sediments and overall review of project reports.

Lake Superior Research Institute

The Lake Superior Research Institute (LSRI) is a research and educational unit on the campus of the University of Wisconsin-Superior. LSRI is experienced in laboratory and field studies in environmental toxicology, analytical chemistry, ecological assessments, and educational programming.

LSRI's biologists and chemists in the aquatic toxicology program area are prepared to perform bioassays and chemical toxicity tests with a variety of aquatic plants and animals. Tests are performed according to EPA guidelines, and may be performed under either static or continuous-flow conditions, and with organisms normally inhabiting either the water column or sediment. Toxicant concentrations may be analyzed throughout the exposures, dependent upon the needs of the study. LSRI maintains an aquatic culturing facility where a variety of organisms are cultured.

LSRI facilities include laboratories for culturing aquatic animals, performing bioassays and toxicity tests, microbiological research, environmental chemistry, and taxonomic analyses. Also available are facilities for biostatistical and computer programming. LSRI has a staff of 10, including 4 with Ph.D. degrees and 5 with Masters degrees. LSRI occupies over 11,000 square feet of floor space including laboratories, offices and support services.

Decision Risk Management

Decision Risk Management (DRM) will again join the SEH team to assist in the development and review of the Human Health Risk Assessment. DRM is located in Bellevue, WA and specializes in risk analysis, risk management plans, site management strategies, enforcement negotiations and expert testimony. DRM reviewed the HHRA report for Segments B and C. Their technical peer review will provide a defendable document for this phase of the project.

Project Personnel

The following individuals have been assembled as the core project team for the Phase Two Investigation of the Newton Creek System. Each of these individuals worked on the investigation of Segments B and C. They bring their collective knowledge and experience to the team for the comprehensive investigation of the remainder of the Newton Creek System. Additional personnel can be added to the project team as necessary to provide the expertise required to complete the tasks. A project organizational chart is provided later in this section and resumes are provided in Appendix B.

Mr. Mark Broses, P.E. will serve as the Project Manager for the project. He is a registered professional engineer in the State of Wisconsin with over 10 years of environmental consulting experience. He managed the first phase of the investigation of Newton Creek and has been involved with several other environmental projects in the Lake Superior. He recently completed an ecological risk assessment and feasibility study for a large contaminated sediment project in Lake Superior. Mr. Broses will administer contracts, maintain project

schedules and budgets, provide overview and technical review of the project, prepare monthly project status reports, and maintain lines of communication between WDNR and the project team. In addition, he will be the primary author of the Ecological Risk Assessment and Remedial Action Options Reports.

Mr. Cyrus Ingraham, P.E., will serve as principal-in-charge for the Newton Creek project. Mr. Ingraham is a partner at SEH, and is a service area leader for SEH's waste management group. Mr. Ingraham has significant experience in managing complex environmental investigation and remediation projects. He is a registered professional engineer in the State of Wisconsin, and has worked in engineering consulting for over 18 years. Mr. Ingraham will provide Qa/Qc review for all documents and will be responsible for proper allocation of SEH resources toward the successful completion of the project.

Mr. John Guhl, P.G., will be the lead hydrogeologist for the project. Mr. Guhl works out of SEH's Chippewa Falls office, and has over 15 years experience as a lead geologist/hydrogeologist on environmental investigation, geotechnical, and shore protection projects. Mr. Guhl has led numerous complex environmental investigations utilizing innovative investigation techniques to obtain the necessary data to move projects to successful remediation. Mr. Guhl has extensive knowledge of geologic and hydrogeologic conditions in the Superior area, and has worked on numerous sediment investigation projects. Mr. Guhl is a registered professional geologist in the State of Wisconsin, and meets the hydrogeologist definition published in ch NR 712.03, Wis. Admin. Code. His role on the project will

include coordination of field activities, review and interpretation of analytical and hydrogeologic data, and report preparation.

Ms. Gloria Chojnacki, CHMM, will serve as Lead Scientist for this project. Ms Chojnacki is a Certified Hazardous Materials Manager (Master Level) and has a Master of Science Degree in Environmental and Public Health. She will complete the site historical review for the project. Ms. Chojnacki is an environmental scientist with extensive experience researching historical evidence relating to environmental projects and interpreting the data in order to identify potential contaminant source areas. Ms. Chojnacki also has significant experience in preparation of human health risk assessments for impacted sites. She completed the Human Health Risk Assessment for Segments B and C of Newton Creek. Her responsibilities on the project will include historical review activities, and preparation of a human health risk assessment.

Dr. Allen D. Uhler, Ph.D. will serve as primary forensic chemist for the project. Dr. Uhler is a Senior Consultant with Battelle's Environmental Forensics Investigation Group. He specializes in petroleum hydrocarbon analysis, petroleum product source identification, chemical fingerprinting and expert testimony. Dr Uhler assisted SEH in the design and implementation of the preliminary forensic analysis for Segments B and C. His findings indicated the likely source of contamination in that area of the creek system is from refinery wastewaters. He will continue with the fingerprinting activities for Newton Creek and Hog Island Inlet initiated in the previous report.

Dr. Mary Balcer, Ph.D. is currently a Senior Scientist and Director of Research at the Lake Superior Research Institute (LSRI). Dr. Balcer specializes in environmental toxicology. She has directed and performed research in the areas of (1) chemical toxicity toward fish and invertebrates, (2) quantitative structure-activity relationships (QSAR) for organic chemical toxicity toward fish, (3) toxicity of contaminated sediments toward benthic organisms, (4) photoenhanced toxicity by UV light, and (5) natural factors in sediments and their influences upon the toxicity of sediment-associated heavy metals and organic compounds. Dr. Balcer has written methods documents for conducting toxicity tests with sediments, as well as several national water quality criteria documents. She is the author of numerous scientific journal articles and technical presentations.

Dr. Kurt Schmude, Ph.D. has been employed by the University of Wisconsin-Superior since 1992; he is currently an Assistant Scientist and teaches aquatic entomology. Dr. Schmude specializes in aquatic insect and invertebrate taxonomy. He is considered a regional expert on this fauna, and

has published 13 scientific articles and written several reports on aquatic invertebrates ranging from taxonomy, distribution, community ecology, and the effects of contaminants on organisms. Dr. Schmude has worked with federal, state, and private groups on projects dealing with the analysis of aquatic macroinvertebrate communities. In particular, he has worked closely with the Wisconsin Department of Natural Resources (WDNR) on macroinvertebrate projects such as inventorying the rare and endangered species of state-owned lands, determining the effects of shoreline development, determining the effects of a leaching landfill, and processing numerous samples from several contaminated sites. In addition, he worked with the WDNR on the 1993-1994 Newton Creek System Characterization of Contamination Study; when he processed the original macroinvertebrate samples. Dr. Schmude also worked with SEH on the investigation of Segments B and C. Dr. Schmude will complete taxonomy on the macroinvertebrate fauna for this phase of work on the Newton Creek System.

Mr. Roger A. Clay, P.E. will be the lead water resources engineer for the project. Mr. Clay is a registered professional engineer in the State of Wisconsin, with over 15 years of experience in water resources projects. Mr. Clay currently works in SEH's water resources group, and has extensive experience in projects involving surface water hydrology and water quality, floodplain delineation, sediment transport, sediment investigations and wetland protection. His responsibilities on the project will include evaluation of the Newton Creek hydraulic profile ton identify transect locations and assistance with the remedial action options review.

Mr. Rick Fox, sediment quality specialist with Hart Crowser, focuses on the assessment of contaminated sediments. He determines sediment and water quality, characterizes and assesses sediment contamination, designs remedial strategies, and negotiates the successful implementation of those strategies with regulatory agencies. As co-chair of the USEPA's Great Lakes National Program Office's Assessment and Remediation of Contaminated Sediments (ARCS) Program Toxicity/Chemistry Work Group, Mr. Fox gained extensive experience in all aspects of sediment assessment. He has extensive experience sampling sediments in many Great Lakes harbors and tributaries, including the Superior-Duluth Harbor. He was co-author or project officer responsible for over ten documents related to sediment assessment in the Great Lakes; including two on establishing Great Lakes SQVs. Mr. Fox has taught courses on sediment assessment and the application of SQVs nation-wide. He is currently a member of the Sediment Assessment Group which provides guidance on the application of SQVs. Mr. Fox will contribute his contaminant and sediment chemistry skills to the project.

Dr. David R. Lincoln, Ph.D. will serve as primary reviewer for the Human Health Risk Assessment. Dr. Lincoln is a Principal with DRM and specializes in risk assessment and management. He was primary reviewer on the HHRA completed for Segments B and C and is familiar with the exposure scenario challenges that need to be addressed during the assessment of the remainder of the stream system.

V. Related Experience

The SEH Team assembled for the Phase Two of the Newton Creek Site Investigation provides significant experience in all disciplines necessary to complete this or subsequent phases of the project. SEH is a truly multidisciplinary firm of over 600 professionals located in over 20 offices throughout the upper Midwest and Western States. Battelle is an internationally acclaimed research and laboratory facility. Hart Crowser is a firm specializing in complex environmental projects. LSRI is a research institute established to provide specialty assessment and laboratory services related to impacted ecosystems. The combined team brings relevant experience to the project. The philosophy of all the firms on the team is to provide exceptional services utilizing current and developing technologies.

The prime example of our team's related experience is the completion of the investigation of Segments B and C for Newton Creek in 2000. Each of the SEH team members were part of that project which was reportedly a pilot for the scope of work to be completed for the remainder of the Creek System.

In an effort to demonstrate SEH's related experience and qualifications, we have provided a number of project summaries in Appendix C "Project Summaries." SEH's summaries provide examples of projects from several related disciplines including: sediment investigation, assessment and remediation, hydraulics and hydrology, wetland delineation and mitigation, stream stabilization, water quality studies, and bioremediation.

VI. Estimated Cost

Costs for the scope of work requested in your December 8, 2000 request for proposal are summarized below. Costs for each of 22 Tasks are summarized by SEH labor, expenses, and subcontract costs. Details of the cost estimate are included in Appendix D.

Task	SEH Labor	SEH Expenses	Subcontract Costs	Estimated Total Costs
Task 1 Historical Review	$14,470	$413	$0	$14,883
Task 2 Work Plan	$7,030	$100	$0	$7,130
Task 3 Site Survey	$9,500	$1,200	$0	$10,700
Task 4 Geologic Borings	$11,100	$945	$12,000	$24,045
Task 5 Sediment Sampling	$15,200	$658	$0	$15,858
Task 6 Water Column Samples	$10,900	$308	$0	$11,208
Task 7 Surface Water Auto Sampler/Monitor	$33,400	$675	$95,000	$129,075
Task 8 Monitoring Wells	$4,180	$0	$3,500	$7,680
Task 9 Bench Scale Study	$12,440	$5,065	$50,000	$67,505
Task 10 Ecological Risk Assessment	$12,340	$0	$55,440	$67,780
Task 11 Human Health Risk Assessment	$21,340	$0	$5,000	$26,340
Task 12 Sediment Quality Objectives	$5,260	$0	$0	$5,260
Task 13 Soil/Sediment Chemical Analysis	$2,340	$150	$78,800	$81,290
Task 14 Surface Water/Groundwater Analysis	$2,880	$308	$19,000	$22,188
Task 15 Forensic Analysis	$2,170	$0	$23,700	$25,870
Task 16 Literature Search Sediment Dating	$400	$0	$4,000	$4,400
Task 17 Investigation Report	$22,290	$250	$1,000	$23,540
Task 18 ERA Report	$23,190	$250	$0	$23,440
Task 19 HHRA Report	$21,490	$250	$0	$21,740
Task 20 Bench Scale Study Report	$6,775	$250	$0	$7,025
Task 21 Remedial Actions Report	$15,430	$250	$1,000	$16,680
Task 22 Project Management & Meetings	$33,360	$0	$0	$33,360
Total	$287,485	$11,070	$348,440	**$646,995**

Approximate cost changes for optional tasks are included in the detailed cost estimate in Appendix D.

VII. Proposed Schedule

The proposed schedule for each of the Tasks is shown below.

Proposed Schedule

Task	Completion Time in Days Following Contract
Task 1 Historical Review	30
Task 2 Work Plan	45
Task 3 Site Survey	45, 120, 240
Task 4 Geologic Borings	90
Task 5 Sediment Sampling	90
Task 6 Water Column Samples	240
Task 7 Surface Water Auto Sampler/Monitor	240
Task 8 Monitoring Wells	90
Task 9 Bench Scale Study	240
Task 10 Ecological Risk Assessment	240
Task 11 Human Health Risk Assessment	240
Task 12 Sediment Quality Objectives	300
Task 13 Soil/Sediment Chemical Analysis	150
Task 14 Surface Water/Groundwater Analysis	150
Task 15 Forensic Analysis	150
Task 16 Literature Search Sediment Dating	90
Task 17 Investigation Report	180
Task 18 ERA Report	270
Task 19 HHRA Report	270
Task 20 Bench Scale Study Report	270
Task 21 Remedial Actions Report	300
Task 22 Project Management & Meetings	330

APPENDIX A

WDNR SOW

WISCONSIN
DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

101 S. Webster St.
Box 7921
Madison, Wisconsin 53707-7921
Telephone 608-266-2621
FAX 608-267-3579
TDD 608-267-6897

December 8, 2000

Mr. Mark Broses
Short Elliott Hendrickson, Inc.
421 Frenette Drive
Chippewa Falls, WI 54729

Subject: Second Phase Site Investigation of Newton Creek Site

Dear Mr. Broses:

We are please to inform you that your firm has been selected to submit a competitive proposal for the Phase Two Site Investigation, Newton Creek and Hog Island Inlet, Douglas County.

Enclosed are the scope of work for the investigation and a copy of the Department's standard contract language. Please submit a proposal to the Department no later than January 5, 2001. Please contact John Burnett at (608) 266-2632, or Jim Hosch at (715) 392-0802 to answer your questions on the scope of work.

The proposal should be sent to the following address:

Department of Natural Resources
Attn: David Behn - FN/1
101 S. Webster Street
P.O. Box 7921
Madison, WI 53707-7921

Thank you for your interest in serving the Department's needs.

Sincerely,

David R. Behn

David R. Behn
Purchasing Agent

enclosures

cc: Jim Hosch - NOR-Superior
John Burnett - RR/3

SITE INVESTIGATION
SCOPE OF WORK FOR
NEWTON CREEK AND HOG ISLAND INLET
DOUGLAS COUNTY

I. Project Description

A. The City of Superior and the Department of Natural Resources, in partnership and cooperation, propose to remediate Newton Creek to Chapter NR 700 series, and Sections NR 102 to 106 Wis. Adm. Code standards. Future use of the area may include a greenway, trail, or park.

B. This scope of work sets forth the requirements for conducting a site investigation and remedial alternatives analysis for the environmental contamination associated in the study area surrounding Newton Creek and Hog Island Inlet, City of Superior, Douglas County, Wisconsin.

C. The site investigation shall determine the investigate the full extent of surface water, sediment, and soil contamination in Hog Island Inlet and Newton Creek and its associated drainage basin. If significant soil impacts exist, this study shall determine if groundwater is being impacted and define the extent and degree of those impacts.

D. The Department of Natural Resources determined in its study titled *Newton Creek System Sediment Contamination Site Characterization Report* (WDNR, 1995) that ecological impacts to Newton Creek are severe. Contaminants found at that time included diesel range organics, oil and grease, polynuclear aromatic hydrocarbons, chrome, mercury and lead.

E. This supplemental site investigation shall determine the sources, nature, and degree of contaminant loading to the sediments, floodplain soils, and water column of Newton Creek and Hog Island Inlet. The study will determine the potential for recontamination of the Newton Creek system following any remedial efforts to be conducted by the City of Superior and the Department of Natural Resources.

F. Newton Creek is located in the Superior plain on the southwestern shore of Lake Superior. The Superior plain consists primarily of red glacial lacustrine clay deposits. The US Geological Survey estimates that drainage area for Newton Creek at approximately 1.73 square miles. According to the Wisconsin Department of Natural Resources, the area of Newton Creek and its contiguous wetlands is an estimated 60 acres. The Creek begins near the Murphy Oil Refinery in Superior Wisconsin, and ends at its mouth located at Hog Island Inlet, which is located in the southeast end of Superior Bay.

G. This study shall supplement information already collected through previous work performed or contracted by the Department including, but not limited to: *Site Investigation Report Newton Creek Segments B &C,* SEH, (2000); *Newton Creek System Sediment Contamination Site Characterization Report* (WDNR, 1995); *Remedial Alternatives Array Document, Prepared for Newton Creek System Site, Superior, Wisconsin,* (RMT, 1995); *Feasibility Study Report, Prepared for Newton Creek System Site, Superior, Wisconsin,* (RMT, 1995).

H. The *Newton Creek System Sediment Contamination Site Characterization Report* (WDNR, 1995) designated the upper to lower segments of Newton Creek with letters A through L. Segment A sediment contamination in the channel was removed in 1997 by Murphy Oil.

I. Site specific information for the Newton Creek site is located in the Wisconsin Department of Natural Resources (WDNR) Superior Office. The WDNR project manager for this contract is James A. Hosch.

II. Study Purpose

A. Document the horizontal and vertical extent of soil and sediment contamination in the Newton Creek system in Segments A through L, and Hog Island Inlet and its associated wetland isthmus. Define the stratigraphic and hydraulic conditions or characteristics in Hog Island Inlet, and its associated wetland isthmus, Newton Creek and its floodplain, and the impacts to Lake Superior. Document the extent of contamination, impacts to the ecology, potential and real adverse human health effects, and various creek and inlet conditions.

B. Determine if Newton Creek or Hog Island Inlet will become recontaminated following remedial activities.
   1. Determine contaminant loading and current source(s) of contaminants to the Newton Creek System.
   2. Determine maximum contaminant loading for the Newton Creek and Hog Island Inlet without adverse impacts to the ecology of the stream or to human health.

C. Develop an alternatives array of appropriate remedial actions that will satisfy the requirements of NR 722.07 Wis. Adm. Code, (each alternative shall be evaluated in terms of successfully restoring the environment) prepare a cost benefit analysis, and recommend an appropriate remedial action or actions for the contamination associated with the Newton Creek and Hog Island Inlet System. The selected remedy shall meet the requirements of NR 722.09 Wis. Adm. Code. The results shall be submitted in a report meeting the requirements of NR 722.13 Wis. Adm. Code.

III. Consultant Responsibilities

A. The consultant agrees to provide the services necessary to adequately investigate soil and sediment contamination, and current sources of environmental contamination impacting Newton Creek and Hog Island Inlet. The consultant will be required to prepare a Draft and a Final Workplan, conduct the investigations, compile the information into a Draft and a Final Reports, and submit two (2) copies of the draft and

final reports to the WDNR office located in Superior, one (1) copy to the Bureau of Remediation and Redevelopment in Madison, and one (1) copy to the Bureau of Watershed Management in Madison. The reports shall be prepared using currently accepted hydrogeologic and engineering methods and shall be in conformance with the provisions of the NR 500, 600, and 700 series, Wis. Adm. Code, and other appropriate rules unless otherwise specified. Reports shall be printed on recycled paper and both sides of the pages should be utilized, if possible.

B. In addition, the consultant may be called upon to provide testimony in a legal action. Any costs associated with such testimony shall be contracted for separately.

C. The consultant shall be required to present information at a minimum of three public meetings. This shall include preparation of appropriate presentation materials for each meeting.

D. The consultant shall identify and attempt to obtain access agreements from property owners (as necessary) for continued access for the WDNR to allow the installation of borings and monitoring wells and submit these agreements to the WDNR. The WDNR access permission form is attached in Appendix A.

E. The work under this contract shall consist of performing those phases or portions of the investigation for the project necessary or incidental to accomplish the project, and which are elsewhere herein specified.

F. The consultant shall furnish all services and labor necessary to conduct and complete the work, and shall furnish all materials, equipment, supplies, and incidentals other than those which are hereinafter designated to be furnished by others.

G. The work under this contract shall at all times be subject to the review and approval of the WDNR, shall be under the direction of its authorized representative, and shall be in accordance with the requirements of contained in the NR 700 series and the WDNR's guidance documents.

H. The consultant shall from time to time during the progress of the work confer with the WDNR and shall prepare and present such information and studies as may be pertinent and necessary or as may be required by the WDNR to enable it to pass judgment on the features of the work. The consultant shall make such changes, amendments, or revisions in the detail of the work as may be required by the WDNR. The WDNR reserves the right to select the alternative to be used and may request additional alternatives be studied.

I. At the request of the WDNR, and during the progress of the work, the consultant shall furnish such maps, portions of reports, or other information or data relating to this work under this contract as may be required to enable the WDNR to carry out or to proceed with related phases of the project not covered by this contract, or which may be necessary to enable the WDNR to furnish information to the consultant upon which to proceed further with the work.

J. Work by the consultant shall proceed continuously and expeditiously through the completion of each phase.

K. Unless the contract has been terminated prior to the completion of the work, the contract shall not be considered terminated upon the completion and acceptance of the work, or upon final payment thereof, but shall be considered to be in full force and affect for the purposes of requiring the consultant to make such revisions or corrections in the work as are necessary to correct errors made by the consultant in the work, or for the purposes of having the consultant make revisions in the work at the request of the WDNR as a "change order."

L. The consultant shall notify the WDNR project manager at least **forty-eight (48)** hours prior to the start of any drilling or sampling activities.

M. The consultant shall commence work within thirty (30) days of awarding the contract.

IV. Project Proposal

A. Prior to awarding the contract, the consultant shall submit a project proposal based on the elements identified in this scope of work. The proposal shall identify key personnel employed by the consultant who will be working on the project and an organizational chart of the project team. A summary of each key employee's educational and work experience shall be provided.

B. The proposal shall contain a schedule for completing the major elements of the project. Each major element scheduled completion date shall be given in the total number of days from the date the contract becomes effective.

C. A meeting with the WDNR project manager is required before submitting a proposal.

D. The consultant shall identify all subcontractors who will be working on the project. Substitutions of key personnel or subcontractors will not be allowed without written request from the consultant and written approval from the WDNR.

E. A cost estimate shall be included in the proposal for each of the following elements: each survey, investigation initial phase, investigation supplemental, and each required report:

1. labor (staff position, title, and labor rates);
2. time;
3. materials;

4. travel costs;
5. equipment and other rental costs;
6. subcontracting costs including laboratory, drilling, and others; and
7. any other costs associated with the deliverables.

F. Reimbursement requests shall made on the State of Wisconsin Invoice for Professional Service (Appendix B). Requests shall itemize costs following the format of item IV.E. above.

G. Progress letters shall be submitted with each reimbursement request that details the accomplishments for the time period of the request.

V. Workplan

A. Historical Review

1. Perform a survey of past and present land use and ownership in the study area. Past and present land use features shall be noted in the report and special regard shall be made of fill areas, waste disposal, underground storage tanks, or spill areas.

2. The consultant shall review all existing, data bases, reports, logs, surveys, analytical data, news articles from local papers, and any information generated by others. Reports available through the WDNR, can be reviewed at the Superior Service Center. All WDNR documents reviewed shall be listed and identified by title, date of publication, and author. The results of previous reports shall be interpreted and utilized for scoping this study.

3. Subject to prior approval by the Department, interviews of current and former local residents, government officials, and industry officials and workers for observances of spills, and other activities which may have impacted Newton Creek and Hog Island Inlet.

B. Workplan

1. The workplan shall be prepared in accordance with the requirements of ch. NR 716.07 and any additional information provided in this scope of work.

2. During and upon completion of the Historical Review, the consultant shall complete a Draft Workplan based on the review and understanding of this Scope of Work and the site investigation goals.

3. Two (2) copies of the draft workplan shall be submitted to the WDNR Superior Office, and one (1) copy to the Bureau of Watershed Management in Madison and one (1) copy to the Bureau of Remediation and Redevelopment in Madison. Following receipt of WDNR comments, a Final Workplan shall be prepared and distributed in a like manner within **fourteen (14)** days.

4. The Workplan shall include:

a. General Information

An introduction describing the study area and purpose of the workplan. A location map identifying potential sources of hazardous substances, known receptors, and proposed sampling locations. A discussion of the regional and local geology and hydrogeology. In addition, the following items shall be included:

b. Historical Review

A section including information obtained during the historical review described above.

c. Site Investigation Plan

This workplan shall describe, with sufficient detail, the investigative techniques such as geotechnical, geochemical, or geophysical, to be performed according to the requirements of Section VI., below.

d. Field Sampling Plan

The plan shall identify the sampling objectives, sample location and frequency, sample designation, analytical methods, and sampling equipment and procedures.

e. Quality Assurance Plan

This plan shall be prepared in accordance with the requirements of ch. NR 711.(11) Wis. Adm. Code. The plan shall include but not be limited to methods of sample preservation techniques, chain of custody and shipping procedures. The plan shall identify decontamination procedures used for drilling and sampling equipment. The plan shall provide information on replicate samples, detection limits, field and trip blanks, and matrix spike analysis. The plan shall also identify the proposed laboratory(ies) to be contracted for analyses. One copy of the plan shall be submitted to the Department with the proposal.

f. Site Safety Plan

A site safety plan shall be developed and followed by the consultant and subcontractors. This plan shall reference all current Occupational Health and Safety Administration (OSHA) standards for worker safety. The consultant is solely responsible for site safety of its personnel, subcontractors, and any bystanders. The consultant is not responsible for liability, claims and costs arising from activities of WDNR personnel or its agents (see item sixteen (16) of the General Terms and Conditions). Receipt of this plan will be acknowledged, but not approved or disapproved by the WDNR project manager.

g. Investigative Waste Management Plan

A plan addressing investigative waste management shall be developed and followed by the consultant according to the General Interim Guidelines for the Management of Investigative Wastes. The plan shall be submitted to the Department for comments and approval.

The consultant is responsible for placing wastes into proper containerization and/or storage. The consultant shall determine if the preferred remedy will allow for the treatment of the investigative waste. The consultant shall take into consideration the "Interim Policy for Promoting the In-State and On-site Management of Hazardous Wastes in the State of Wisconsin."

h. Work Schedule

The consultant shall submit a work schedule for conducting the investigation. Milestones in the schedule shall be based upon days from award of the contract. At a minimum, major tasks such as project start-up, soil, sediment and water sampling, sample analyses and submittal of draft reports shall be included.

i. Site Investigation

The site investigation shall be performed in accordance with the requirements of chs. NR 712 and NR 716.09 Wis. Adm. Code, guidelines provided in the most recent version of the *Guidance for Conducting Environmental Response Actions*, WDNR, PUBL SW-157-92, and any additional information provided in this scope of work.

The purpose of the Site Investigation is to gather sufficient information to properly assess environmental conditions in the study area. Based on the findings, an *Alternatives Array* of appropriate remedial actions shall be evaluated in terms of successfully restoring the surface and subsurface environment. If during the development of the alternatives array, it is necessary to perform a treatability study a workplan to determine the effectiveness of the likely option(s) shall be submitted to the Department. Upon Department approval of the treatability study workplan, implementation of the treatability study(ies).

j. A cost benefit analysis comparing the cost effectiveness of each alternative shall be prepared. A recommendation of the most suitable remedial action or actions shall be made by the consultant.

k. Treatability study workplan.

The purpose of the study is to determine design parameters for an in-field treatment system.

C. Site Surveys

The consultant shall make such surveys as are necessary to accomplish the work under this Scope of Work. Such surveys shall be complete with respect to detail and to such degree of precision and accuracy as necessary to develop the plans for the Site Investigation Report of the project. All of the following surveys shall be compiled into individual GIS layers for sections A-L and Hog Island Inlet. Information available from existing reliable sources, such as the City of Superior's GIS data base and *Site investigation Report Newton Creek Segments B and C, Superior Wisconsin* (SEH, 2000) shall be used where applicable.

1. Utilities - The consultant is responsible for locating all utilities, right-of-ways, etc.. in the vicinity of the study area prior to any investigation activities.

2. Topographic - Upon completion of borings and monitoring wells, a topographic survey shall be completed for vertical and horizontal control of all pertinent study area and investigation features.

3. Ecological - The consultant shall review existing WDNR information and identify if any known state or federally threatened species are located with a one (1) mile radius of the study area.

4. Property Ownership - The consultant shall identify on a map all property owners likely to be affected by remedial activities.

5. Soil and sediment samples shall be collected utilizing standard undisturbed soil sampling techniques. Samples shall not be composited for testing purposes.

6. Borings shall be installed according to the requirements of ch. NR 141 Wis. Adm. Code. A boring log (Form 4400-122) shall be submitted for each boring. For each major soil layer encountered, a soil sample shall be field classified according to the Unified Soil Classification System (USGS).

7. Field screening techniques may be employed to aid in determining the depth and location of borings and monitoring wells. These techniques may use field screening instruments as deemed appropriate and approved by the WDNR Project Manager. The workplan shall identify if and what type of field screening will be employed.

8. Boreholes shall be abandoned according to the requirements of ch. 141, Wis. Adm. Code. Form 3300-5b shall be completed for each abandoned borehole.

B. Geologic Borings

1. A maximum of 78 soil borings shall be used to adequately define the soil conditions and potential pathways of contaminant migration in the floodplain of Newton Creek during the initial investigation. Borings for Newton Creek shall be performed in series of transects through the Creek. Each transect location will be determined by information from the hydraulic profile. Exact spacing of the transects will depend on field conditions and other relevant data. Each transect will consist of one sediment sample and two to four soil borings on each side of the creek.
2. A maximum of 20 soil borings shall be used to adequately define the soil conditions and potential pathways of contaminant migration at the wetland isthmus and shoreline at Hog Island Inlet during the initial phase of this investigation.
3. Twelve additional borings shall be held for supplemental investigation of both Newton Creek and Hog Island Inlet pending results of the initial phase of this investigation.
4. Borings shall be installed by personnel meeting the requirements of ch. NR 712.05 Wis. Adm. Code.
5. Soil samples shall be collected utilizing standard undisturbed soil sampling techniques. Samples shall not be composited for testing purposes.
6. Soil borings shall extend to the water table, surface elevation or a maximum of 30 feet below ground surface, whichever is less.
7. Borings shall be installed according to the requirements of ch. NR 141 Wis. Adm. Code. A boring log (Form 4400-122) shall be submitted for each boring and/or monitoring well.
8. For each major soil layer encountered, a representative soil sample shall be analyzed for grain distribution (mechanical and/or hydrometer as appropriate to the soil type) and classified according to the Unified Soil Classification System. The grain size distribution curves shall be included in the reports. A maximum of one sample per section of the creek, and five samples for the Isthmus
9. Soil borings may be converted to monitoring wells, as appropriate.
10. The use of mud or drilling fluids other than air will not be permitted.
11. Field screening techniques may be employed to aid in determining the depth and location of borings and monitoring wells. These techniques may use field screening instruments as deemed appropriate and approved by the WDNR Project Manager. The workplan shall identify if and what type of field screening will be employed.
12. Boreholes not converted to monitoring wells shall be abandoned according to the requirements of ch. NR 141, Wis. Adm. Code. Form 3300-5b shall be completed for each abandoned borehole.

C. Sediment Samples

1. A maximum of 52 sediment samples shall be used to adequately define the sediment conditions and potential pathways of contaminant migration in Newton Creek. One sample from the bioactive zone, and one sample to define vertical extent of contamination. A maximum of 10 representative sediment samples shall be collected for particle size analysis.
2. A maximum of 80 sediment samples shall be used to adequately define the sediment conditions and potential pathways of contaminant migration in Hog Island Inlet. One sample from the bioactive zone, and one sample to define vertical extent of contamination. A maximum of 16 representative sediment samples shall be collected for particle size analysis.
3. Sediment samples shall be collected utilizing standard undisturbed sediment sampling techniques. Samples shall not be composited for testing purposes.
4. In addition to the aforementioned sediment samples, a maximum of 10 sediment traps will be used to measure sediment accumulation. Sediment accumulation shall be measured following significant precipitation events and layers of contaminated sediment shall be measured and recorded. Sediments for analysis shall be collected on a maximum three events following significant sediment accumulation. six traps in Newton Creek, three Hog Island Inlet, and one Superior Bay.

D. Water Column Samples

1. A maximum of 40 water samples shall be used to adequately define the water quality conditions and potential pathways and sources of contaminant migration at the study area. The 40 samples is based on two sampling events of 20 samples. An attempt shall be made to collect samples during the initial flush of a heavy rainfall event and during a heavy snow melt event.
2. Water samples shall be collected utilizing standard sampling techniques. Samples shall not be composited for testing purposes.
3. As part of the Human Health Risk Assessment a method of collecting water samples shall be utilized to simulate sediment disturbance in order to determine realistic exposures for activities such as wading in Newton Creek and Hog Island Inlet. A maximum of 12 water samples shall be collected.

E. Surface Water/Discharge Automatic Sampler/Monitor
   1. Each of the systems shall include:
      a. aromatic hydrocarbon monitor
      b. temperature monitor
      c. conductivity
      d. pH
      e. telephonic data transmission and alarm
      f. monitoring equipment shelter

g. concentration triggered sampling capability
h. telephonic sample triggering capability

2. Initially, one automated monitor/sampling device shall be utilized to determine and correct any design or operation issues related to the systems.

3. Upon correction of any design issues, three automated monitor/sampling devices shall be rented for a four month monitoring period for this project. Monitoring shall begin in February, 2001. An option to buy the automated monitors/sampling devices at the end of the trial period shall be included in the proposal.

4. A maximum of twelve samples are to collected automatically. The samples shall be analyzed for the surface water parameters.

F. Monitoring Wells

1. During completion of the first phase of soil borings the Field Geologist may install a maximum of six (6) groundwater table observation wells or piezometers shall be used to adequately define the groundwater conditions, and potential pathways of contaminant migration at Newton Creek. The intent of the monitoring wells is to determine if a performance standard for the groundwater pathway requirements of NR 720.19(2) Wis. Adm. Code is a potential option or if groundwater contamination exists at a given location. The decision to install the wells shall be based on field observations and the likelihood of the groundwater to be contaminated above NR 140 Wis. Adm. Code Standards.

2. Monitoring wells shall be constructed according to the requirements of ch. NR 141 Wis. Adm. Code.

3. Groundwater table observations wells and piezometers shall be installed to adequately provide information on the direction of groundwater flow and contaminant concentrations. The locations of the individual wells and nests may be determined according to the results of a geophysical survey and/or field screening techniques as deemed appropriate. Locations of the existing groundwater table observation wells should be taken into consideration. Analytical groundwater data of the wells shall be evaluated to verify the results of any screening or surveys performed.

4. Monitoring wells shall be screened at those depths where contaminants are most likely located. The length of screen shall be chosen appropriate for the contaminants of concern and the formation to be monitored. Screens shall be placed such that individual wells only monitor one lithostratigraphic unit. Construction techniques shall be fully described and diagrammed in the workplan.

5. For each well installed and/or sampled the WDNR Monitoring Well Construction Form (4400-113A), Monitoring Well Development Form (4400-113B), and Groundwater Monitoring Well Information Form (4400-89) shall be completed per instructions on the forms. If a variance to the requirements of Ch. NR 141, Wis. Adm. Code, is believed to be necessary, an application and approval for a variance shall be submitted to Jim Hosch, Wisconsin Department of Natural Resources, prior to installation.

G. Bench-Scale Study

Conduct a bench-scale test followed by a pilot-scale demonstration to evaluate the feasibility of using wetland treatment as a remedial option on the Newton Creek system. The conceptual wetland treatment cell would utilize both a surface water flow component and a subsurface flow component to allow treatment of both normal flow conditions and infrequent high flow conditions.

A bench-scale test is to be conducted in a wet laboratory and utilize representative creek bed sediments in a simulated creek channel environment to evaluate resuspension and settling characteristics during normal and flood conditions. The bench-scale test shall evaluate various parameters including plant uptake, water velocity, water depth, and flood duration. The test shall also evaluate the desorption of contaminants from the sediments to the water column. Selected wetland plants would be obtained and planted in a recirculating system to observe potential contaminant treatment effects. If results from the bench-scale test are favorable, the consultant shall provide design recommendations for a field study.

H. Ecological Risk Assessment

1. Perform an ecological risk assessment using the triad approach.
2. Included with the results of this study shall be recommendations for final clean up goals for any remaining sediments, soils, and surface waters.
3. Aquatic Macroinvertebrate analysis of selected areas within Newton Creek, Hog Island Inlet, and Superior Bay. Samples may include: Core, artificial substrate, and activity traps. Samples collected shall be examined for abundance and diversity.
4. A comparison of applicable literature sediment quality objectives to chemical results found at Newton Creek and Hog Island Inlet.
5. A study of UV incident light shall be performed at six locations in Hog Island Inlet and Newton Creek. Measurements shall occur at surface, mid, and bottom depths.
6. UV toxicity studies shall be performed on *Hyalella azteca*, *Lumbriculus variegatus*, and *Chironomus tentans* based on the information gathered from the study in Paragraph I. 4..

I. Human Health Risk Assessment

1. Expand the existing risk assessment to include present and future uses of the Newton Creek drainage basin and Hog Island Inlet. The inclusion of this provision is not a determination that achieving that the applicable residual contamination levels is not practicable.
2. Assumptions used in the exposure model shall be consistent with NR 720 Wis. Admin. Code and EPA methodology, except where directed by the Department.
3. Conduct a Health Risk Assessment for Hog Island Inlet.
4. Determine and report the demographics and site usage.

J. Sediment Quality Objectives

Sediment Quality Objectives shall be developed based upon the results of the Human Health Risk Assessment and the Ecological Risk Assessment. The Objectives shall be developed in conformance with NR 700 Wis. Adm. Code series.

K. Chemical Analyses

1. The analyses of samples shall be performed in accordance with the requirements of ch. NR 716.11 Wis. Adm. Code.
2. The consultant shall collect and analyze samples to determine contaminant concentrations in all affected media. All soil and sediment sample results shall be reported in units of ug/kg on a dry weight basis. All water sample results shall be reported in units of ug/L.
3. Soil/Sediment Samples

Sample locations shall be based upon the information gathered in the historical review. Samples shall be analyzed by a Wisconsin certified laboratory for the presence of volatile organic compounds (VOC's), polynuclear aromatic hydrocarbons, cadmium (Cd), chrome (Cr), lead (Pb), and mercury (Hg) and chrome 6+ (Cr^{6+}), acid volatile sulfides/simultaneously extracted metals (AVS/SEM). All levels of detection shall be appropriate to determine compliance with NR 720 generic residual contaminant levels.

L. Surface and Ground Water Samples

Groundwater samples are to be collected from each new groundwater monitoring wells, piezometer(s), private wells identified during the historical review, two (2) weeks after installation and again one (1) month after the first sampling round (excluding hydraulic probe locations for the second sampling round). All surface and groundwater samples shall be analyzed by a Wisconsin certified laboratory for the presence of polynuclear aromatic hydrocarbons, cadmium (Cd), chrome (Cr), lead (Pb), and mercury(Hg), chrome 6+ (Cr^{6+}), In addition, all groundwater samples shall be analyzed for volatile organic compounds (VOC's).

M. Forensic Analysis

N. Up to twenty (20) samples shall be analyzed for an extended list of PAH's or other parameters in order to determine contaminant origin. Samples may be sediment, soil, surface water, groundwater or discharge water.

O. A literature search to determine if it is feasible to determine the time of contaminated sediment deposition using cesium dating, or other techniques. A recommendation shall be made to the Department's Project Manager on the feasibility of dating sediments. Upon Project Manager approval, dating of sediments shall occur. Results, as well as limitations, shall be provided to the Department within 45 days of completion of any laboratory work. If the recommendation is to proceed, a proposal for dating sediments shall be submitted to the Department to be completed under a separate contract.

N. Water table elevation measurements

Water elevation measurements shall be recorded for each groundwater monitoring well, and any private or sand point wells (if possible and appropriate) identified during the historical review, two (2) weeks after installation and again one (1) month after the first sampling round (excluding hydraulic probe locations for the second sampling round). Water level measurements shall be measured to 0.01 foot accuracy.

O. Field Measurements

Surface water shall be measured for temperature, conductivity, and dissolved oxygen at all sampling locations. The date and time of all measurements shall be recorded.

VI. Reports

A. Results from the studies outlined in this scope of work shall be submitted in reports within 60 days of completion of field and laboratory activities. The following reports shall be submitted:

1. Investigation of Newton Creek, Hog Island Inlet, and Superior Bay
2. Human Health Risk Assessment
3. Ecological Risk Assessment
4. Responsible Party Search to include point source study, historical information, and forensic analysis
5. Bench-Scale Treatability Study
6. Remedial Actions Options Evaluation and Recommendation (DNR shall make the selection)

Each report shall be prepared in accordance with the applicable requirements of NR 712.07 and NR 716.13 Wis. Adm. Code, guidelines provided in the most recent version of the *Guidance for Conducting Environmental Response Actions*, WDNR, PUBL SW-157-92, and any additional information provided in this scope of work. The report shall be printed on recycled paper and both sides of the pages should be utilized, if possible. In addition, each report shall be submitted on a compact disk in portable document format.

B. Narrative

The report shall follow the format outlined in ch. NR 716.13(3) Wis. Adm. Code. The report shall include a discussion of potential remedial action alternatives, NR 722 Wis. Adm. Code. A cost benefit analysis comparing the cost effectiveness of each alternative shall be prepared. A recommended remedial action should be identified and the reason for its selection give. If not, a discussion describing any additional requirements for further study shall be prepared. Remedial actions report shall be prepared for the Department.

C. Plan Sheets Section

1. All plan sheets shall be prepared in accordance with the requirements of ch. NR 716.13(3)(h) Wis. Adm. Code, guidelines provided in the most recent version of the *Guidance for Conducting Environmental Response Actions*, WDNR, PUBL SW-157-92, and any additional information provided in this scope of work.
2. The results from the subsurface investigation shall be presented on 24 inch by 36 inch plan sheets. Reduced versions shall be incorporated in the report.
3. A base plan sheet shall be prepared for the Newton Creek site. A permanent benchmark shall be established for both vertical and horizontal control and all elevations shall be related to U.S. Geological Survey data. The contaminated soil area as well as a general estimate on the extent of groundwater contamination shall be delineated. The property boundaries of and possibly the contaminated adjacent properties and ownership, buildings, water supply wells, underground utilities, manmade features, surface depressions, surface waters, hydraulic probes, soil borings, groundwater monitoring wells and other pertinent information shall be included. This plan sheet shall include a complete legend, north arrow, bar scale, and transect of the cross sections.
4. Additional plan sheet(s) shall be drawn indicating contaminant isoconcentration contours for the parameters which most accurately depict the degree and extent of contamination. The concentration for that parameter shall be presented for each well or boring. This map shall also have the same scale as the base plan sheet.
5. A base plan sheet shall be prepared or an existing City of Superior shall be utilized as the base map for the Newton Creek study area. A permanent benchmark shall be established for both vertical and horizontal control and all elevations shall be related to U.S. Geological Survey data. The boundaries of the study area, property boundaries and ownership, buildings, water supply wells, manmade features, surface depressions, surface waters, hydraulic probes, and other pertinent information shall be included. This plan sheet shall include a complete legend, north arrow, bar scale, and transect of the cross sections.
6. Additional plan sheet(s) shall be drawn indicating contaminant isoconcentration contours for the parameters which most accurately depict the degree and extent of contamination. The concentration for that parameter shall be presented for each well or boring. This map shall also have the same scale as the base plan sheet.
7. Geologic cross sections shall be constructed through all transects and appropriate monitoring wells which include major geologic, geomorphic, and culturál features (if appropriate). The geologic cross-sections shall indicate horizontal and vertical heterogeneities within hydrostratigraphic units. The vertical distribution of contaminants shall be shown. Water table, perched aquifers, and potentiometric surfaces shall be included as appropriate. For monitoring wells, the screened interval shall be indicated and for borings, discrete sampling intervals shall be identified. Cross-sections should be chosen in a manner which best describe the site geology and movement of contaminants on and away from the site and, if only two are drawn, should be perpendicular to each other. At least one cross section should be parallel to the groundwater flow direction. As appropriate, flow lines and equipotential lines shall be included to indicate local or regional flow regimes. Each cross section shall include reduced versions of the plan sheet that identifies locations of the transect.
8. If monitoring wells are installed, water table contour maps shall be drawn based on stabilized water levels. The Newton Creek base plan sheet shall be used as a basis for these maps. One water table contour map should be drawn for each of the two groundwater sampling rounds.
9. A water table contour map shall be drawn based on the depth of groundwater in the hydraulic probes. The Newton Creek study area base plan sheet shall be the basis for this map.

D. Technical Data Section

All technical data such as boring logs, geophysical data, WDNR abandonment forms, water level measurements, soil and groundwater sampling results including summary statistics, soil tests, chain of custody documentation, etc., shall be included in the report.

E. All physical and chemical analytical results, water level measurements, and aquifer tests shall be presented in tabular format and presented in the report.

F. Report Submittal

1. The consultant shall prepare each Report in draft form and submit two (2) copies to the WDNR Superior Service Center, one (1) copies to the WDNR Bureau of Watershed Management in Madison. and one (1) copies to the WDNR Bureau of Remediation and Redevelopment Management in Madison. The draft reports shall be submitted within **sixty (60)** days of completion of all field activities. Within 30 days of receipt of WDNR comments, a Final Report shall be prepared and distributed in a similar manner. In addition, Final Reports shall be submitted to the following entities:

Entity	Contact	Format
DHFS	Henry Nehls-Lowe	CD-ROM
County Health	Vicky Drake	CD-ROM
City of Superior	Paul King	CD-ROM
Lakehead Pipeline, LLP	Mark Sitek	CD-ROM
Murphy Oil, U.S.A.	Joe Amato	CD-ROM
City of Superior, Public Library	Librarian	Report
St. Louis River CAC	Lynelle Hanson	CD-ROM

2. In addition, three (3) copies of each report shall be submitted to the Department's Project Manager in portable document format (PDF) on a CD-ROM.

VIII. Progress Reports

Progress reports shall be submitted to the Project Manager with each reimbursement request that details the accomplishments for the time period of the request. These reports shall describe activities undertaken during each time period. These shall include but not be limited to: material review, subcontractor bidding, surveys performed, site preparation, borings and wells installed, samples collected, problems encountered and/or resolved, progress on report preparation, etc. One copy of text only shall be provided to the Northern Region Remediation and Redevelopment Team Leader John Robinson.

IX. WDNR Responsibilities

The State of Wisconsin through the WDNR agrees to provide the following support:

A. The WDNR will assign a project manager to serve as an official representative of the WDNR who will resolve in writing any problems of policy and procedure issues and will provide information on the site.

B. The WDNR project manager will be able to conduct on-site inspections with the consultant prior to proposal preparation and during site investigation activities.

C. The WDNR will be responsible for all public information activities associated with the project. The WDNR retains sole rights to all data collected for this study. No data may be used by the consultant for any other purposes until the final report is released to the public by the WDNR.

D. The WDNR retains the right to request a change of consultant's personnel if it determines that existing personnel cannot adequately perform the required tasks. Any such request will be submitted in writing to the consultant. Within seven (7) days of receipt of such request, the consultant will provide the WDNR with a list of proposed individuals and their qualifications. The WDNR will evaluate the list and choose a suitable replacement within seven (7) days. If the WDNR deems that none of the proposed substitutions are acceptable the contract will be declared void and the contractor dismissed. The contractor will be reimbursed for time and materials expended to that point. All data collected will be turned over to the WDNR.

X. Consultant Evaluation

At the completion of the project, the WDNR may conduct a consultant evaluation. The following criteria will be evaluated:

A. Ability to meet project schedules and budgets.
B. Accuracy & completeness of contract documents or construction work based on contract specifications.
C. Responsiveness to field observations and recommendations by the WDNR Project Manager.
D. Overall professional responsibilities demonstrated.
E. Satisfactory administration of contract billing, proposal preparation, and construction documentation as evidenced by timeliness and completeness.

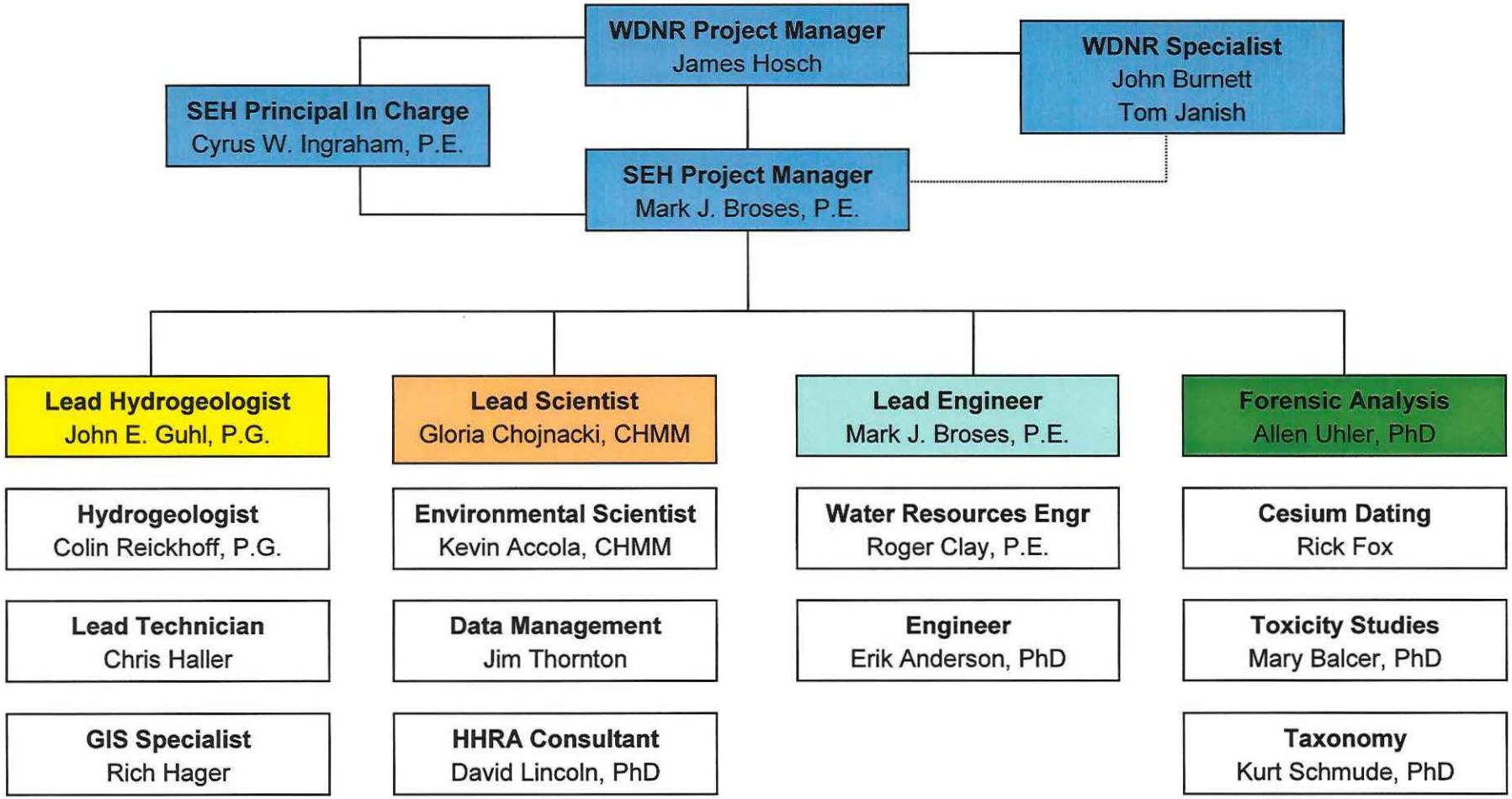
Attachments:

A. Access Permission Form
B. Invoice for Professional Service

APPENDIX B

ORGANIZATIONAL CHART

AND RESUMES



Tasks
Site Investigation
Surface Water Monitoring
Automatic Samplers
Surveys/GIS

Tasks
Historical Review
Human Health Risk Assessment

Tasks
Point/Non Point Sources
Remedial Action Options

Tasks
Forensic Analysis
Toxicity Studies
Macroinvertabrate Studies
Cesium Dating

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Mark Broses, P.E. — Associate/Project Manager

Education

Bachelor of Science
Civil and Environmental Engineering
University of Michigan
Ann Arbor, Michigan (1990)

Professional Registration/ Certification

Professional Engineer in Wisconsin and Michigan

OSHA 40-Hour Hazardous Waste, Certified

Continuing Education

Bioremediation of Chemically Contaminated Waste Sites, NWWA (1990)

Prevention, Detection, and Restoration of Petroleum Hydrocarbons, NGWA (1991)

Bioremediation Symposium – Battelle (1993)

EPA RREL Symposium on Innovative Remediation (1995)

Cleaning Contaminated Sediment, UW Madison (1996)

Landfill Gas System Engineering Design (1996)

Gas, Oil, and Environmental Biotechnology and Site Remediation Technologies, IGT (1997)

Quality Management Courses

Detecting Deficiencies in Drawings and Specs, UW Madison (1995)

Project Management Tools and Systems, St. Thomas (1996)

The Quality Management Series, St. Thomas (1997)

General Background

Project engineer and/or project manager on over 200 public and private sector environmental projects in the Great Lakes Region. Primary focus has been engineering of environmental remediation systems and is responsible for preparation of feasibility studies, design reports, cost estimates, plans and specifications, construction documentation, operations and maintenance (O&M) plans, and status reports. Experience prior to consulting includes wastewater treatment system operations, and construction/demolition fieldwork. Member of the SEH Corporate Quality Leadership Team, the Waste Management QA/QC Team, and has received significant internal and external training in quality processes and continuous improvement.

Experience

WDNR Environmental Repair Fund – Ashland Lakefront Property, Wisconsin. Remedial Action Options Feasibility Study to reduce risk from MGP waste contamination of 10 acres lakefront property and 10 acres off-shore sediments. Contaminated media includes soils, wood, groundwater, sediments, surface water, and off-gases. Study includes treatability studies for sediment settling, contaminant dispersion/separation, and insitu bioremediation. Options evaluated include engineering controls, in situ treatment, ex situ removal and treatment, off gas control, and water treatment. Served as lead engineer and phase manager.

WDNR Environmental Repair Fund – Ashland Lakefront Property, Contaminated Sediments, Wisconsin. Ecological Risk Assessment to evaluate risks associated with 10 acres of PAH contaminated sediments. ERA included integrated evaluation of Sediment Quality Triad components: benthic survey, toxicity studies, and sediment chemistry toxic units. Responsibilities included evaluation of the data and final author of the report.

Wayne Reclamation Superfund Site – Indiana. Remediation System Design and engineering oversight of system to remediate over 10 acres of chlorinated VOC contaminated soil and groundwater. System included 48 well air sparging/SVE network, 10 well groundwater recovery, 250 gpm water treatment system, 3,000 cfm off-gas treatment system. Responsibilities included conceptual and final design, design reports, response to EPA comments, engineering cost estimate, equipment selection, plans and specifications, bidding, and peer review of related documents (CQAP, O&MQAP, O&M Plan, etc). Provided home office engineering support and technical review of all submittals during construction phase.

Better Brite Plating, Brownfields Demonstration Site – Chippewa Falls, Wisconsin. Prepared corrective action plan and contract documents for demolition/removal of building and chromium contaminated debris. Design of geomembrane cap for residual soil contamination, oversight of City contractors, and coordination with City, WDNR, and EPA representatives.

Wisconsin Department of Administration (WDOA) Division of Facilities Development (DFD), Fuel Storage System Improvements at several sites including a State Office Building-Madison, UW-La Crosse, and UW-Eau Claire; Project Manager for design and installation of new storage tank systems, and assessment of existing tank removals. Responsibilities included: coordination of communications between WDOA project manager, facility manager, DFD construction representative, contractor, and regulators; oversight of design and implementation of client review comments; technical submittals review; and project accounting.

WDOA-DFD, National Guard Facility, Fuel Storage System and Storm Water Management Improvements – Onalaska, Wisconsin. Project Manager for design and installation of new storage tanks systems, removal of existing tank systems, new storm and sanitary sewer, and storm water detention basin.

WDOA-DFD, National Guard Facility, Remedial Excavation – Ashland, Wisconsin. Project engineer and phase manager for design and implementation of 1,500-cubic yard contaminated soil excavation and offsite thermal treatment, and site restoration.

Site Investigation, Confidential Client – Amery, Wisconsin. Project Manager for site investigation of operating industrial facility and evaluation of wastewater pretreatment system. Investigation is focussed on delineation of possible metals contamination to soil and groundwater. Responsibilities include client and regulatory communications, QA/QC, and project accounting.

Grantsburg Ranger Station, WDNR Bureau of Facilities and Lands. Project Manager for design/build remediation system to address historical contamination. Responsibilities include client and regulatory communications, design oversight, project QA/QC, contractor negotiations, and project accounting. Remediation system utilized air sparging to reduce the bulk of contamination and is currently being monitored for natural attenuation feasibility.

Wisconsin PECFA Program. Remediation systems for petroleum contamination at several active and inactive independent retail service station sites. Responsibilities included development of remedial action options, conceptual designs, construction plans and specifications, PECFA bidding, installation oversight, and engineering review of operations and maintenance status reports. Systems installed included soil vapor extraction, air sparging, free product and groundwater collection and treatment, off-gas treatment, and enhanced in situ bioremediation.

Mobil Oil Company – Great Lakes Region. Remediation systems for several retail gasoline stations located in Illinois, Michigan, and Wisconsin. Responsibilities included: SVE/air sparging pilot tests, remedial alternatives analysis, conceptual design, Corrective/Remedial Action Plans, cost estimates, final design packages, equipment procural, permitting, installation oversite, and preparation of O&M manuals.

Bulk Fuel Storage Facility – Muskegon, Michigan. Design of remediation system to address 20 acres of subsurface petroleum contamination. Implemented closed-loop groundwater pumping and bioremediation system integrated with air sparging and SVE. Off-gas was treated via biofiltration.

Bulk Fuel Storage Facility – Dearborn, Michigan. Design, permitting, and oversight of installation of petroleum free product and groundwater recovery system for 5-acre site. Integrated collection system with existing facility water treatment system.

Confidential Marine Facility – Superior, Wisconsin. Preliminary evaluation and cost comparison remedial action options for metals-contaminated sediments in Lake Superior.

Jackson County Sanitary Landfill Biopiles – Black River Falls, Wisconsin. Provided engineering oversight for design of biopile treatment system. System includes capacity for three 6,000 ton biopiles with active aeration and moisture control system.

Fort McCoy Biopiles – Monroe County, Wisconsin. Prepared design documents for multiple biopile treatment study. Study included comparison of eight different biopile configurations.

Auto Transport Facility – Janesville, Wisconsin. Design and implementation of remediation system to address four acres of diesel fuel contamination. System includes dual phase free product and groundwater pumping, air sparging, SVE and bioremediation.

Village of Kendall – Kendall, Wisconsin. Responsible for design, bidding, and construction of remediation system. Project includes excavation and thermal treatment of 6,000 tons petroleum contaminated soils, installation of soil vapor extraction, free product collection and groundwater pump and treat system. Construction ongoing.

Former Electrical Substation – West Allis, Wisconsin. Design of remediation system to address petroleum and PCB contamination of subsurface. System utilized groundwater and free product pumping and separation, PCB adsorption, air stripping and off-gas treatment.

Operating Industrial Facility – Princeton, Illinois. Design of groundwater pumping and treatment system for remediation of vinyl chloride contaminated groundwater. Integrated pretreatment system with existing plant wastewater treatment and recirculation system.

Former Industrial Facility – Troy, Michigan. Performed pilot tests and prepared feasibility study and conceptual design to remove large volumes of chlorinated DNAPLs from subsurface. Options evaluated thermal and surfactant enhanced removal, groundwater and product pumping and treatment, in situ volatization, and containment.

Operating Industrial Facility – Bloomer, Wisconsin. Design of in situ air sparging and SVE system to remediate two acres of petroleum contaminated soil and groundwater.

Closed Municipal Landfill – Hayward, Wisconsin. Remediation System. Innovative aerobic bioreactor/landfill gas collection system design that resulted in large cost savings. System included 14 LFG extraction wells, 600 cfm gas processing equipment, condensate collection and storage system, innovative landfill temperature monitoring system, and telemetry monitoring and early warning system. Design analysis indicates that LFG treatment not required. Responsibilities included: technical/economic evaluation of landfill gas and groundwater remediation options; LFG extraction pilot tests; evaluation of LFG quality; conceptual design report; regulatory negotiations and permitting; plans and specifications; O&M Plan; bidding; and technical submittals review.

Closed Municipal Landfill – Rice Lake, Wisconsin. Landfill gas abatement system analysis of landfill gas migration dynamics. Technical/economic evaluation of LFG abatement options. Conceptual design and cost estimate for passive LFG cutoff system using perimeter trench venting system. Oversight of final bid plans and specifications.

State Disposal Landfill – Michigan. Technical and economic evaluation of treatment options for impacted water supply.

Wisconsin Point Landfill – Wisconsin. Technical and economic evaluation of leachate recovery, treatment, and disposal options.

Sunrise Landfill – Michigan. Technical and economic evaluation of leachate remediation options. Design of leachate collection system for closed, unlined landfill.

Hunts Disposal Landfill Superfund Site – Wisconsin. Independent technical/economic evaluation of pre-final design documents for confidential client. Documents included Design Report, Plans and Specifications, O&M Plan, and CQA Plan. Evaluation included sensitivity analysis of cost contingencies.

Tomah Landfill Superfund Site – Wisconsin. Independent technical/economic evaluation of remedial investigation and remedial action options analysis for City. Evaluation included recommendation of additional alternatives and associated cost analysis.

Presentations/Publications

"Source Control of Landfill Related Groundwater Contamination via Active Gas Extraction and Aerobic Bioremediation" at the 20th International Madison Waste Conference describing an innovative approach to landfill gas remediation which saved the client $1,000,000 over traditional approaches.

Cyrus W. Ingraham, P.E. — Principal
Senior Project Manager

Education

Bachelor of Science
Mining Engineering
University of Wisconsin
Madison (1982)

Graduate Studies, Civil and Environmental Engineering
University of Wisconsin
Milwaukee

In-Situ and Onsite Bioremediation - Battelle (1993)

Understanding Site Remediation, University of Wisconsin, Madison (1995)

Understanding the Global Environmental Market
US EPA (1997)

Professional Registration/ Certification

Professional Engineer in Wisconsin

OSHA 40-Hour Hazardous Waste, Certified

Professional Associations

American Society of Civil Engineers

General Background

Project Manager on hazardous waste, environmental compliance, solid waste, site assessment, air toxics, remedial investigation and remedial action projects. Performed technical and managerial responsibilities on a variety of environmental projects. Experience in design, permitting, construction and closure of solid and hazardous waste facilities involving approval of the state and federal regulatory agencies. Performed site assessments, remedial investigations and remedial actions in several states involving a working knowledge of a variety of regulatory requirements. Performed several projects for solid waste landfills including design, permitting, construction documentation and remediation. Completed projects for industrial clients involving RCRA corrective action and closure plans.

Experience

Confidential Client – Western Wisconsin. Assisted in the proper classification of wood ash from facility boiler. The WDNR initially classified the waste as hazardous based on isolated grab samples. SEH developed a statistically sound sampling strategy to reduce the variables in the sampling and analytical methods. The resulting analysis indicated that the waste would be properly classified as a solid waste.

Confidential Marine Facility – Superior, Wisconsin. Developed closure plan for 14 hazardous waste areas of concern at a 100-year old shipyard. Project includes work plan development, WDNR negotiation, field investigation and development and implementation of closure plans. Areas of concern included 10 acres of impacted sediment, dry docks, solvent storage areas, waste paint area, and two landfills.

Confidential Superfund Responsible Party – Southern Wisconsin. Evaluation of costs for RD/RA phase of CERCLA landfill remediation. The evaluation considered the appropriateness of the selected remedy, capital cost estimates, O&M cost estimates and contingency cost estimates. A sensitivity analysis was conducted for the contingency costs to develop a total estimated project cost.

Northwestern Wisconsin Electric Company – Fuel Storage Services. Served as project manager during the upgrade of fuel storage facilities at four diesel powered generating facilities. The storage facilities ranged in capacity from 30,000 to 70,000 gallons. Services included conceptual design development, cost estimating, permitting, final design, construction observation and development of SPCC plans.

Northwestern Wisconsin Electric Company, Inc. – Various Locations. Served as Client Manager during the completion of over 20 environmental projects. Significant investigations completed at four diesel power generation facilities contaminated with PCB, fuel, oil and solvents. Prepared closure plans for waste water lagoon and waste disposal areas. Performed investigations and remediation at approximately 15 transformer spill sites. Prepared a PCB Waste Contingency Plan. Completed investigation and

remediation of transformer maintenance area. Completed negotiations with the WDNR to avoid referral of client to Department of Justice.

Confidential Paint Manufacturer – Milwaukee, Wisconsin. Soil and groundwater contamination assessment, RCRA Corrective Action work plans, UST removal, leak detection monitoring. The facility was the largest generator of hazardous waste in Wisconsin.

Better Brite Plating Facility – Chippewa Falls, Wisconsin. Assisted the City in obtaining a Brownfield Grant to investigate the degree and extend of chromium contamination in soil and groundwater. Acted as liaison between U.S. EPA and the City in the emergency removal of hazardous waste and impacted soil. Prepared bid documents for the demolition of the building, disposal of wastes and redevelopment of the site.

Lemler Landfill – Rice Lake, Wisconsin. Developed site monitoring plan for methane gas and groundwater. Managed the investigation of the limits of waste. Completed the design of a passive gas extraction system. Negotiated remedy with the WDNR and provided expert testimony.

Tomah Sanitary Landfill – Tomah, Wisconsin. Evaluation of Hazardous Ranking System results of landfill scoring for inclusion on the National Priority List (NPL). Review of draft final Remedial Investigation (RI) report. Develop recommendations for supplemental investigation activities. Review of Draft Final Feasibility Study (FS) to determine the appropriateness of the preferred remedy and accuracy of estimated costs. SEH also provided an alternative remedial approach and supplemental information supporting the selected alternative.

Fairgrounds Superfund Site – Tomah, Wisconsin. SEH completed an evaluation of the Hazardous Ranking System scoring which resulted in the site being included on the NPL. SEH reviewed RI activity results prepared by the USEPA and provided recommendations for future activities. SEH reviewed the Record of Decision (ROD) and provided the City of Tomah with comments regarding a proposed monitoring program. SEH is performing the required activities identified in the ROD.

WDNR ERF, Ashland Waterfront – Ashland, Wisconsin. Performed 120 year site history review, remedial investigation, feasibility study, and sediment analysis for 10-acre lakefront property contaminated with VOC, PAH, and heavy metals. Developed Existing Conditions Report which included the definition of degree and extent of contamination for 500,000-cubic yards of contaminated materials. Managed preparation of a Human Health and Ecological Risk Assessment for the site. Feasibility Study included evaluation of solidification, soil washing, bioremediation, containment, and groundwater pump and treat. Work was performed in accordance with CERCLA.

Boundry Road Superfund Site – Germantown, Wisconsin. Development of site preparation specifications for RI/FS phase at former hazardous waste landfill.

Ogema Hills Landfill – Germantown, Wisconsin. Alternative final cover test plot construction documentation, liner and final cover documentation, slurry wall construction oversight, groundwater remediation pump test, landfill groundwater monitoring.

Former Railroad Roundhouse – Ashland, Wisconsin. Performed initial site investigation to characterize waste types impacting soil and perched groundwater at the site. Project includes negotiation with WDNR to develop a fast-track remediation approach to prepare the site for development.

Public Works Facility – Ashland, Wisconsin. Performed Phase I Environmental Assessment and Phase II Environmental Assessment prior to facility design. The results of the assessments were used to develop remedial system (SVE) designs which were incorporated into facility plans and specification. Provided construction oversight and documentation. Project included removal of 3,500-cubic yards of contaminated soil, SVE system, and groundwater removal and treatment. Site included two PECFA eligible areas.

Allen-Bradley (A Rockwell International Company) – Milwaukee, Wisconsin. Remedial Investigation of ammonia release, UST removal and remedial action, compliance audit, SPCC preparation, closure of resin plant and hazardous material tanks, multiple site assessments.

Confidential Ink Manufacturer – Milwaukee, Wisconsin. RCRA closure of hazardous waste storage tank, soil and groundwater remediation.

WDMA - Hayward Armory – Hayward, Wisconsin. Performed history review and remedial investigation for tetrachloroethane contaminated groundwater. Investigation included performing 20 hydraulic probe samples for onsite analysis (gc). Defined degree and extent of groundwater contamination, developed remedial action plan. Performed remedial investigation and remedial action to address soil contamination. Investigation included hydraulic probe sampling to define degree and extent of contamination. Remedial action included pump and treatment followed by natural attenuation.

St. Francis School District – St. Francis, Wisconsin. Performed environmental assessments and chemical inventory for five schools. Project included chemical disposal, remedial investigation, risk assessment of PNA contaminated soil, risk assessment of electro magnetic fields, UST removals and PCB remediation.

Ladish Pacific Incorporated – Vernon, California. Asbestos survey and removal, plant closure plan development, removal of seven USTs, demolition oversight, site remediation.

A. W. Oakes and Sones – Racine, Wisconsin. Design and permitting of contaminated soil storage facility.

Glacier Park Company – Seattle, Washington. Twenty-five Phase I and thirty-five Phase II Environmental Site Assessments of former railroad and industrial properties.

Wara Enterprises, Inc. – Neenah, Wisconsin. Remedial investigation and correction action plans for four service stations in central Wisconsin. Remediation of two of the sites and preparation of PECFA applications.

Metro Landfill – Franklin, Wisconsin. Final cover design and construction documentation.

Brookfield Landfill – Brookfield, Wisconsin. Development and oversight of groundwater remedial investigation including the use of geophysical methods (seismic, gamma logging, thermal).

Land Reclamation Landfill – Racine, Wisconsin. Permitting of solid waste storage pad and pretreatment facility (thermal treatment) for contaminated soil.

Wisconsin Electric Power Company – Oak Creek, Wisconsin. Design of fly ash landfill drainage system utilizing power plant bottom ash as drainage media. Clay borrow source evaluation and testing.

Expert Testimony, Grannis and Hauge. Provided expert testimony in case regarding the standard of care required during Phase I Environmental Site Assessments. Reviewed historical documents to evaluate standard of care at the time the ESA was completed. Evaluated the completeness of the documents and contractual arrangement between the plaintiff and defendant.

John E. Guhl, P.G. — Hydrogeologist

Education

Bachelor of Science
Geology and Geography
University of Wisconsin
Oshkosh (1978)

Post Graduate Study,
Hydrogeology
University of Wisconsin
Oshkosh (1979-80)

Post Graduate Study,
Hydrogeology
University of Wisconsin
Milwaukee (1993)

Professional Registration/ Certification

Professional Geologist
State of Wisconsin (PG #120)

Professional Geologist
State of Indiana (PG #1643)

Professional Geologist
State of Illinois (196-000-510)

American Institute of
Professional Geologists
(CPG #7570)

OSHA 40-Hour Hazardous
Waste, Certified

OSHA 8-Hour Hazardous
Waste Site Supervisor,
Certified

Certified for use of
Troxler Electronic Laboratories
Nuclear Testing Equipment

Professional Associations

Wisconsin Ground Water
Association

Society for Mining, Metallurgy,
and Exploration

General Background

Lead hydrogeologist for SEH's Waste Management Service Area with experience in heading remedial investigations and remediation projects on a variety of solid waste, hazardous waste, and petroleum sites. Experience includes coordination and oversight of field investigation, sampling and testing activities; report and remedial action plan preparation; subcontractor coordination; and remedial action plan implementation. Has served as project manager on numerous environmental projects achieving successful closure on sites impacted by a variety of contaminants. Meets the hydrogeologist criteria defined in chs. NR 500, 600 and 700 of the Wisconsin Administrative Code.

Experience

Regional Airport – West Central Wisconsin. Performed remedial investigation of subsurface ethylene glycol contamination resulting from past deicing practices at the site. Defined degree and extent of soil and groundwater impacts at the site, and worked with Wisconsin Department of Natural Resources to attain closure for the site.

Extruded Plastic Manufacturer – St. Croix Falls, Wisconsin. Performed remedial investigation of a waste hydraulic oil release at the facility. Excavated impacted soils and remediated using biopile treatment. Attained site closure from Wisconsin Department of Natural Resources.

County Highway Shop – Northwest Wisconsin. Performed remedial investigation of two former diesel underground storage tank beds. Identified degree and extent of soils contaminants. Performed modeling to establish site-specific residual contaminant levels for compounds exceeding State soil standards. Closure of the site is currently pending with Wisconsin Department of Natural Resources.

160-Acre Property – Greenwood, Wisconsin. Performed a closure assessment of a gasoline underground storage tank being removed as part of a property transfer. Performed an immediate response to remediate soil contamination identified during the closure assessment. Obtained site closure from Wisconsin Department of Natural Resources on schedule to facilitate the property transfer.

10-Acre Lakefront Property – Ashland, Wisconsin. Performed remedial investigation of subsurface and off-shore manufactured gas plant wastes on a State funded remediation project. Performed over 100 offshore sediment sample borings, delineating approximately 10 acres of impacted sediments.

Dairyland Reservoir Sediment Investigation – Ladysmith, Wisconsin. Performed sediment investigation to assess potential elevated mercury concentrations in reservoir sediments. Obtained sediment samples from water depths up to 70 feet. The data from the investigation was used in relicensing the hydroelectric dam operation.

Fort James Paper Sediment Investigation – Ashland, Wisconsin. Collected and analyzed sediment samples from lake Superior in order to assess potential environmental impacts associated with water outfalls from a former papermaking facility.

Waterfront on the Bay Marina – Bayfield, Wisconsin. Collected and analyzed sediment samples from Lake Superior to assess potential lead impacts from ship maintenance activities. Requested closure of the site from Wisconsin Department of Natural Resources.

McKinley Beach Restoration Project – Milwaukee, Wisconsin. Resident inspector during construction of a breakwater-manmade beach shore protection system along a one-half mile reach of Lake Michigan shoreline in downtown Milwaukee.

Wisconsin Point Landfill – Superior, Wisconsin. Performed Environmental Contamination Assessment of a 25-acre abandoned solid waste landfill in accordance with WDNR Closure Plan Modification.

Hayward Landfill – Hayward, Wisconsin. Performed environmental contamination assessment of a 20-acre abandoned solid waste landfill identifying potential impacts to down gradient receptors and proposing short-term and long-term remedial alternatives for the site.

Former Hartford Municipal Landfill – Hartford, Wisconsin. Prepared in-field conditions report for a 19-acre former municipal landfill on behalf of the City of Hartford in response to a WDNR consent order.

Former Service Station Properties – Kendall, Wisconsin. Performed remedial investigation and site remediation of two petroleum-impacted properties formerly operated as service stations. Remedial activities included excavation and thermal treatment of impacted soils and groundwater pump and treatment.

Baker Oil Company – Hawkins, Wisconsin. Performed subsurface investigation of soil and groundwater contamination at a bulk petroleum storage facility.

Jill's 76 – Bloomer, Wisconsin. Performed remedial investigation of on and offsite groundwater impacts from operation of a gasoline underground storage tank system.

Glacier Park Company - 40-Acre Ship Docking Facility – Pensacola, Florida. Performed remediation of VOC and SVOC impacted soil in a ship bilge disposal area. Obtained site closure upon completion of remediation from the FDER.

ADRON Drum Disposal Site – East Hanover, New Jersey. Provided oversight during removal of over 2,000 buried drums at a former flavors and fragrances factory. Provided qualitative screening of the drum contents and directed disposal of the drum contents.

Croda Inks Corporation Hazardous Materials Tank Removal – Atlanta, Georgia. Directed removal of three underground storage tanks containing

materials used in ink manufacturing process. Directed remediation of VOC impacted soils resulting from leakage from the UST system.

Manufactured Gas Plant Waste Dump, Giddings and Lewis Facility – Milwaukee, Wisconsin. Performed remedial investigation of a 2-acre manufactured gas plant waste dump identified during a Phase I ESA. Elevated concentrations of cyanide as well as low pH were identified associated with the dump area after the dump had been overlooked during an ESA performed by a different consultant.

Wiscraft Inc. Workshop for the Blind – Milwaukee, Wisconsin. Performed remedial investigation, prepared remedial action plan, and performed site remediation to address soil and groundwater VOC contamination associated with past industrial usage of the Wiscraft site. Remedial activities included removal of hazardous materials and petroleum USTs, excavation and disposal of TCLP characteristic hazardous waste soils, and installation of a groundwater pump and treat system.

Wara Enterprises, Inc. – Appleton, Wisconsin. Performed Phase II, III, and IV investigations of four gasoline service stations located in the Fox Valley. Directed field investigation and remediation activities at the properties. Prepared remedial investigation report and closure documentation.

Glacier Park Company – Eight Sites, North Dakota, South Dakota, and Minnesota. Performed Phase II and Phase III investigation of eight properties owned by Burlington Northern Railroad. Investigation activities performed to address potential environmental concerns identified during Phase I investigation of leased railroad properties.

Gloria Chojnacki, CHMM — Environmental Scientist

Education

Masters of Science
Environmental and Public Health, University of Wisconsin Eau Claire (1992)

Bachelor of Science
Medical Technology
University of Wisconsin Milwaukee (1974)

Professional Registration/ Certification

Certified Hazardous Materials Manager

40-Hour HAZWOPER, Certified

Professional Associations

Federation of Environmental Technologists

Air and Waste Management Association

Institute of Hazard Materials Management

General Background

Senior scientist responsible for project and task management of a wide variety of environmental projects. Technical responsibilities include all phases of due diligence environmental site assessments and audits including regulatory agency database searches and collecting, interpreting, and reporting related data. Responsibilities also include mobile source noise evaluation and modeling using the FHWA Traffic Noise Model and air emission assessment.

Experience also includes RCRA site investigations, remediation and closure plans, and bioremediation and treatability studies for industrial sites. Gloria also functions as a resource for regulatory compliance issues, risk based corrective action and site closure, human health risk assessment, risk management plans, and environmental management system design. Additional experience includes the preparation of air quality Operating Permits (including Title V and state permits), annual inventory emission reports, and mass balance evaluations. Gloria has also developed a comprehensive company Health and Safety Program for the Waste Management service area including site specific Health and Safety Plans.

Experience

Confidential Printing Company - Waseca, Minnesota. Evaluation of potential liabilities associated with disposal of specific solid wastes from this facility. Assessment of the solid waste source separation process, incineration and ultimate disposal of the ash in a monofill landfill cell along with potential liabilities associated with neighboring properties and potential receptors were included in the evaluation.

Tomahawk Foundry - Rice Lake, Wisconsin. Air Operating Permit Application to fulfill Title V requirements under the CAA for existing grey iron foundry. Construction permit and non-Part 70 Operating Permit Application for replacement furnace.

IKE International - Stanley, Wisconsin. Air Operating Permit Application to fulfill Title V requirements under CAA for a wood veneer manufacturing facility.

Mason Shoe - Chippewa Falls, Wisconsin. Wisconsin Annual Emissions Inventory and Air Operating Permit to fulfill Title V Part 70 requirements under the CAA for a major source shoe manufacturer.

Leinenkugel's Brewing Co. - Chippewa Falls, Wisconsin. Prepared air Discharge Permit Application for brewing operation.

Chippewa County Annex - Chippewa Falls, Wisconsin. Indoor air assessment including chemical inventory and source control recommendations.

Dana Transport - Hammond, Indiana. Prepared annual emission statement. Reviewed facility processes and emission points in order to

evaluate appropriateness of existing permit. Reorganized facility wash logs and determined facility was under air discharge reporting requirements.

Barron County Asphalt Plant – Barron, Wisconsin. Annual Emissions Inventory Report and amendments to Mandatory Operating Permit. Facility record keeping and equipment changes to comply with BACT requirement.

Pope & Talbot – Eau Claire, Wisconsin. Ch NR 445 WI Admin. Code compliance reporting including dispersion modeling.

Confidential Client – Western Wisconsin. Assisted in the proper classification of wood ash from facility boiler. WDNR initially classified the waste as hazardous based on isolated grab samples. Assisted in developing a statistically sound sampling strategy and analytical methods to properly classify material as a solid waste.

Confidential Marine Facility – Superior, Wisconsin. RCRA Site Investigation and Closure Plan for 14 hazardous waste areas of concern. Including historical review, waste handling and disposal practices review, gathering, interpretation and reporting of investigation data and site health and safety responsibilities.

Wisconsin State Lead Lakefront Property Environmental Repair Fund Project – Ashland, Wisconsin. Performed a CERCLA level Human Health Risk Assessment and historical review to identify past and present potential sources of onsite contaminants. Research potential wood treating and manufactured gas processes which may have been used onsite. Prepared site specific Site Health and Safety Plan.

Confidential Plastics Manufacturer – Frederic, Wisconsin. Provided input to a RCRA remedial investigation, recommended remedial action and closure plan.

Dahlberg Light & Power – Solon Springs, Wisconsin. Hazardous waste stockpile management and remediation/closure plan and feasibility study for treatment alternatives. Permitting needs evaluated for selected treatment alternative and preparation of required onsite variance for treatment of a listed hazardous waste.

River Country Co-operative – Chippewa Falls, Wisconsin. Conducted investigation of agricultural chemicals spill and prepared evaluation and documentation of data and remedial action options report.

Confidential Client – Birchwood, Wisconsin. RCRA Site Investigation and Closure Plan for lead particulate contaminated property. Responsibilities included field investigation, waste handling and disposal, site health and safety evaluation, reporting of data and regulatory negotiation on remediation approach and preparation of closure documentation.

Fort McCoy Military Reservation – Monroe County, Wisconsin. Completed biotreatability study, provided input to the construction and management of several ongoing ex-situ biopiles. Evaluation of passive design and effectiveness in petroleum remediation.

Jackson County Sanitary Landfill – Black River Falls, Wisconsin. Provided input to the design of a bioremediation facility for treatment of petroleum contaminated soils. Responsible for ongoing treating/supervision of required regulatory monitoring, reporting, and record keeping activities.

Village of Albany, Wisconsin. Assisted in design and management of bioremediation pile for treatment of petroleum contaminated soil. Responsible for monitoring, recordkeeping, and closure of project.

A-1 Materials – Chippewa Falls, Wisconsin. Performed Phase I Site Assessments at 4 ready mix concrete sites including historical information gathering and regulatory database searches to determine potential environmental liabilities.

Valley Bank, Precision Auto Body – Chippewa Falls, Wisconsin. Performed a Phase I and II preacquisition site assessment at an auto body repair and painting facility according to due diligence and ASTM standards.

Markquart Motors, Inc. – Chippewa Falls, Wisconsin. Performed a Phase I and II preacquisition site assessment at an auto sales and service facility according to due diligence and ASTM standards. Project included remediation and monitoring of soil contamination.

I-94 Rest Areas – Wisconsin Department of Transportation. Coordinated the removal and thermal treatment of petroleum contaminated soils for the Wisconsin DOT from two interstate rest areas.

Pre-Acquisition Site Assessments. Numerous site assessments in western Wisconsin on residential, commercial, and industrial sites. Site assessments were completed for Lutheran Social Services, Cadott Industrial Park, Chippewa County Farm, and City of Ashland.

Remedial Investigation Projects. Soil and groundwater investigations were completed for a number of public sector clients in western Wisconsin. Sites investigated included Dresel Standard Service, Jill's 76, Jennico, Inc., Klimek Bulk Facility, Huffcutt Concrete, and The Rafters of New Lisbon, Wisconsin.

Task Manager for:

Responsibilities for the following projects included: prepared due diligence environmental site assessment, traffic air emission compliance assessment, current field noise measurement, and traffic noise modeling for highway corridor needs assessment for future design and construction.

I-39/USH 51 Corridor & Environmental Study – Marathon County, Wisconsin.

STH 60 Corridor Study – Washington County, Wisconsin.

Tomah/I-94 Interchange Justification and Environmental Study - Monroe County, Wisconsin.

DAVID R. LINCOLN, PhD

DECISION RISK MANAGEMENT, INC.
6110 145th Place SE
Bellevue, WA 98006

Phone: 425-562-0756
drlincoln@compuserve.com

SUMMARY

Professional with over 20 years experience in the management and analysis of complex risk problems in human health and/or the environment. Recognized for the development and refinement of innovative and creative risk management approaches to site classification, remedial investigations and actions, and data management. Clients include private industry, U.S. Department of Energy (DOE), the U.S. Department of Defense (DOD), the U.S. Environmental Protection Agency (EPA), and state agencies. Provided litigation support on cases involving potential or actual toxic exposures. Highly skilled as a credible and understandable communicator of risk-related information to the public, government agencies, corporate management, and technically-oriented specialty groups.

PROFESSIONAL EXPERIENCE

Decision Risk Management, Inc., Bellevue, Washington 1994-present
PRINCIPAL

Specialized in applying assessment and management processes to health risks and costs. Products include site risk management plans and/or priorities, human health risk assessments, litigation strategies, and chemical data interpretations. Manages projects preparing and evaluating human health risk assessment, data quality objectives, site strategy and sampling plans, conceptual site models, nature and extent of contamination, and data management systems.

Risk Management — Assisted in the project design, assessment, and decisions on risk management at a CERCLA site involving acute waterfowl mortality from exposure to white phosphorus in an artillery range. Also major contributor to improvements in data management and the use of a geographic information system. Because the site conditions and major contaminant have little precedent, this project has included the development of novel site remedial objectives, and continued evaluation of the project methods for consistency with regulatory requirements.

Risk Assessment — Prepared risk assessment of current and potential groundwater exposure. Operations at a major overseas chemical company have resulted in leaks and spills of chlorinated hydrocarbons. The proposed assessment method was accepted by the local agencies, and the results indicated that there were very low current risks to the surrounding neighbors.

Prepared risk assessment of human ingestion exposure to fish contaminated with dioxins and furans for an international client. Chemical plant operations had contaminated bay sediments.

Assisted in the preparation of the quantitative risk assessment for the Ashland Lakefront Property in Ashland, Wisconsin. Chemicals of potential concern included polycyclic aromatic hydrocarbons, volatile organic compounds, and metals. Exposure media included

soils, surface water, and groundwater. Exposure routes included ingestion, dermal absorption, and inhalation. The potential receptors included workers, and recreational adults and children.

Mactec, Richland, Washington 1994
SENIOR SCIENTIST

Reviewed and assisted in the preparation of data quality objectives plans and the remediation program at the Hanford radioactive waste tanks.

CH2M HILL, Bellevue, Washington 1983-1994
SENIOR RISK ASSESSMENT MANAGER

Managed projects and performed technical consulting on over 100 projects for site remediation and risk assessments. Developed and implemented new methods and tools, improving the cost-effectiveness of hazardous waste site management and the risk assessments. Executed projects under CERCLA/SARA, RCRA corrective action, and state remediation programs. Also NEPA and air toxics regulatory programs.

Risk Management

Reengineered the site remediation process, applying a cost-effective method, the observational method, and reducing time, cost, and risks. Major petroleum client claimed $1 million savings in the RI/FS. Process also adopted by DOE, and EPA.

Interpreted baseline risk assessment results in terms of implications for proposed actions. Included streamlining the process and establishing realistic site assessments and remedial goals, reducing perceived site risks many-fold.

Consulted on methods to prioritize multiple contaminated areas within regulatory and client financial constraints, maintaining client control despite high regulatory interest.

Conducted evaluation of proposed state PCB soil cleanup levels. Resulted in the withdrawal or delay of proposed values in several states, saving utilities considerable remediation expense.

Risk Assessment

Managed interdisciplinary teams and provided senior consulting to multi-media risk assessments at numerous hazardous waste sites, chemical plants, landfills, smelters, manufactured gas plants, spills, impoundments, incinerators, and manufacturing facilities. Chemical contaminants have included dioxins, PCBs and other chlorinated hydrocarbons, volatiles, semi-volatiles, and inorganics.

Developed and implemented Monte Carlo program for probabilistic risk assessment, providing more realistic site assessments and decreasing the perceived risks by one to two orders of magnitude, substantially reducing remediation cost.

Consulted on the development of sample-specific risk assessment method, reducing the perceived risks at hazardous waste sites, and the remediation cost.

Provided review comments at the request of EPA to their guidance on human health risk assessments.

Data Management: Developed concept of data life-cycle for integrating steps of hazardous waste site investigation and feasibility study: planning, data acquisition, quality evaluation, management, and analysis. Managed company project to develop and distribute integrated software tools for these steps, which improved data quality and reduced client cost.

Seminars: Presented "Site Remediation - Problem Statement and Key Concepts" for the course entitled "Data Sufficiency and Decision Making for Site Remediation" for several years. Sponsored by Department of Engineering Professional Development, University of Wisconsin.

Presented many seminars to industrial groups, DOD, DOE, EPA, and civic groups on site investigation strategies, and risk assessment.

Government Advisory Committees: Served on the Washington State Science Advisory Board to advise the Department of Ecology on technical issues related to hazardous waste site remediation.

Served on the panel on Hazardous Waste Sites in Transportation Rights-of-Way of the Transportation Research Board, National Research Council.

Department of Engineering and Public Policy 1976-1983
Carnegie-Mellon University, Pittsburgh, Pennsylvania
ASSOCIATE PROFESSOR 1982-1983
Assistant Professor 1978-1982
Visiting Assistant Professor 1977-1978
Post-doctoral Fellow 1976-1977

Responsible for teaching and research on chemical environmental policy.

Risk Management: Applied decision analysis tool to assess the environmental effects of multimedia tradeoffs in pollution control for coal-fired power plants, assessing the overall effectiveness of proposed and required technologies, and regulations.

Risk Assessment: Developed probabilistic model to assess the release rates of microorganisms from containment buildings by integrating material handling operations, building design, human factors, and external events.

Prepared assessment of potential human health effects from powerline electromagnetic fields.

Education	Taught several courses on chemical risk assessment and management, including compensation for delayed diseases from exposure to chemicals, federal policy on toxic trace metals, and hazardous wastes in Pennsylvania.
Government Advisory Committees	Served as a member of the environmental release subcommittee of the USEPA's Biotechnology Advisory Committee. Served as an alternate member of the technical advisory committee for the local air pollution control agency.

EDUCATION

Ph.D., Biochemistry, University of Oregon Health Sciences Center, 1977.
B.A., Chemistry, University of California (San Diego), 1971.

PROFESSIONAL REGISTRATION

Registered California Environmental Assessor (REA-02310).

AFFILIATIONS

Air and Waste Management Association
Society for Risk Analysis

PUBLICATIONS AND PRESENTATIONS

List is available upon request.

Allen D. Uhler, Ph.D. **Battelle**

Senior Consultant
Environmental Forensics Investigation Group

Education

Ph.D. Chemistry, University of Maryland — 1983
M.S. Chemistry, University of Maryland — 1981
B.A. Chemistry, SUNY, Plattsburgh — 1978

Qualifications

Dr. Uhler has 15 years experience in the field of petroleum environmental chemistry, with an emphasis on environmental forensics—petroleum hydrocarbon analysis, petroleum product source identification, chemical fingerprinting, and damage assessments. Dr. Uhler has developed analytical methods for the measurement of petroleum-related hydrocarbons in the environment, and has led numerous investigations of the occurrence and fate of petroleum in the aquatic and terrestrial environment. His particular expertise is the analysis of petroleum hydrocarbons and other trace organic compounds in waters, soils, and sediments, the use of numerical chemometric techniques to elucidate relationships between samples and suspected sources, differentiation of petroleum products in multiple input scenarios, evaluating weathering characteristics of petroleum, and tracking petroleum product transport in complex, contaminated environments.

He has conducted numerous assessments of the occurrence, fate, and environmental effects of fugitive petroleum at refineries, offshore oil and gas production platforms, bulk petroleum storage facilites, and along petroleum pipelines.

Affiliations/Appointments

Editorial Board, *Journal of Environmental Forensics*. Amherst Press. 1999-present.

Invited chairperson, International Business Communication's 3rd Executive Forum on Environmental Forensics. Washington, D.C. June, 2000.

Invited chairperson, International Business Communication's 2nd Executive Forum on Environmental Forensics. Washington, D.C. June, 1999.

Founding Co- Editor-in-Chief, *International Journal of Environmental Forensics*. Amherst Press. 1998-1999.

Feature Editor, "Environmental Forensics", in *Soil, Sediment, Groundwater*. 1998-present.

Invited speaker, National Environmental Forensics Conference: Chlorinated Solvents and Petroleum Hydrocarbons. August 27-28, 1998, Tucson, AZ.

Editorial Advisory Board, *Soil, Sediment, Groundwater*. 1997-present.

Technical Advisory Committee, Association for Environmental Health of Soils, 1996-present.

Moderator, *Chemical Analysis,* 12th Annual Conference on Contaminated Soils, Amherst, MA.

Staff Fellow, US Food and Drug Administration, Division of Environmental and Elemental

Allen D. Uhler, Ph.D. (Continued)

Contaminants Branch, Methods Development Group, Washington, DC. 1985—1987.

Associate Referee, Association of Official Analytical Chemists, (AOAC) 1985—present.

Faculty Research Associate, University of Maryland, 1983—1985.

Examples of Relevant Experience

Delineation of PAH Contamination in Sediments near a Major East Coast Refinery. A major east coast petroleum refinery is currently under an administrative order to characterize PAH contamination in the lower Delaware River, DE. Working in tandem with University of Maryland scientists, Dr. Uhler is participating in a multi-year monitoring program to delineate PAH contamination in the river, identify refinery and non-refinery sources of PAH to the river system, and allocate proportional amounts of PAH in the river system. Advance chemical measurements of an extended list of PAH compounds and sterane and triterpane biomarkers are being utilized for forensic markers Battelle is also characterizing the dissolved, colloidal, and particulate fraction of PAH and the fraction of PAH available to benthic organisms in the river. Ultimately, this data will be used in a comprehensive ecological risk assessment of the refinery discharges to the Delaware River.

Source of PAH in the Thea Foss Waterway. Battelle, under contract to the Thea Foss Petroleum Group, undertook a detailed examination of the nature and sources of PAH in the Thea Foss Waterway, located just outside of Tacoma WA. The Group—who handle light distillate products along the waterway—have been implicated by the State of Washington as potential contributors to PAH contamination in the waterway. Battelle collected surfical and core sediments from along the waterway, and performed GC/FID 'fingerprinting', extended PAH and biomarker analysis to adequately characterize the waterway sediments. In it's interpretative report, Battelle consultants Drs. Scott Stout and Allen Uhler determined that the overwhelming nature of PAH in the waterway arose from combustion sources and coal-derived liquids, e.g. coal tar and creosote. Virtually no inputs of PAH from petroleum storage and handling facilities could be detected in the sediments from the river, forming the basis for a rational argument by the Group that their operations were not responsible for PAH in the waterway.

Identifying PAH in Sediments at Alameda Point, CA. During site closure investigations at Alameda Naval Air Station, the US Navy discovered near-shore sediments with highly elevated PAH. Because only 16 priority pollutant PAH were measured during the BRAC investigation, it was impossible to ascribe a source to the contamination. Dr. Uhler headed a forensic investigation for the Navy, in which sediment samples were analyzed for diagnostic PAH, heteroatomic aromatic hydrocarbons, and sterane and triterpane biomarkers. The PAH assemblages were found to be residues from a Manufactured Gas Plant operation previously sited in the area which had used residual oil as the starting material for gas production. Discovery of the unique biomaker bisnorhopane—unique to Monterey Crude Oil—documented the true source of the oil used to in the MGP process. No fuel oil PAH were found in the sediments, demonstrating that the preponderance of the PAH in the study area arose from turn-of-the-century MGP operation.

Allen D. Uhler, Ph.D. (Continued)

Identification of Refined Petroleum Products in the Subsurface at a European Refinery. One of Greece's largest petroleum refineries was faced with controlling, identifying the contents, and remediating a major subsurface plume of mixed refined petroleum products. Confounding the control issue was the multitude of possible on-site sources for the fugitive petroleum, including site pipelines and over 100 bulk storage tanks. Battelle was retained to provide high resolution mapping of the petroleum products that comprised the fugitive plume and identify the types of products present at different locations in the plume in an effort to pinpoint the exact sources of the petroleum releases. Free product samples were collected from across the site, and their compositions determined using petroleum forensic techniques. Coupling the source identification with historic tank and pipeline handling data, Battelle was able to identify specific bulk storage tanks responsible for the majority of the fugitive pools. These findings allowed the refinery engineering staff to isolate and repair only those tanks responsible for the release, thereby minimizing the impact of remedial activities to the refinery operations.

Identifying sources of gasoline contamination near a major Southern California Refinery. Battelle was retained by a major oil and gas company who operated a pipeline in a complex pipeline corridor near a large refinery in Southern California to identify the sources of gasoline to a contaminated commercial property. An industrial property owner, whose property had become contaminated with gasoline from an unknown source, had sued multiple potentially responsible parties that included the refinery and numerous pipeline operators, including our client. Battelle conducted detailed forensic chemical analysis of free product and soil-bound gasoline, and mapped the compositional variations in gasoline in the area. The chemical composition of the gasoline and the organic lead concentration and speciation were found to be different than that handled by our client over the tenure of their pipeline ownership. Fate and transport consideration pointed to more likely sources near the property in question. Our client settled favorably without going to trial.

Chemical Fingerprinting of Diesel, Gasoline, Crude Oil, and Soot Released During Fugitive Product Release and Fire: Areal Extent of Contamination. Working for large petroleum shipping firm and refinery, analyzed samples from a 10 square mile area near the site of a large petroleum fire to assess impact of product and soot released during a product release and fire on the San Jacinto River, TX. Used ultra-sensitive analytical methods to differentiate possible chemical "fingerprint" from confounding background petroleum signals and, using statistical principal component analysis (PCA), demonstrated that only a very small percentage of impacted municipal and homeowner sites actually had measurable amounts of petroleum compounds of concern present. Worked with client's legal counsel to present data in a straightforward and understandable manner. Wrote expert reports for several class action suits brought against defendants. Designated expert in 3 class action suits brought against PRP.

Identification of Petroleum Hydrocarbons in Contaminated Sediments near a Refinery. Working for a major U.S. oil company, assisted in the evaluation of a site after the client purchased a petroleum bulk storage and distribution facility and discovered that a portion of the land and underlying groundwater was contaminated with petroleum products. In an effort to identify the composition of the petroleum hydrocarbon and aid in identifying possible sources of the material, collected a suite of subsurface soils and groundwaters, and analyzed them for alkanes,

polynuclear aromatic hydrocarbons (PAH), sterane and triterpane biomarkers, and alkyllead compounds. Detailed hydrocarbon fingerprinting analysis revealed that the contaminant in the soils and groundwater was actually a mixture of gasoline, diesel fuel, and lubricating oil. The concentration of tetraethyllead (TEL) in the gasoline fraction of the contaminating hydrocarbons was consistent with TEL levels in older (pre-1986) gasoline formulations, likely discharged before our client purchased the facility. Further characterization of the samples revealed the presence of hopane biomarkers in the mixture of contaminating hydrocarbons. No hopanes were found in any of the petroleum products handled by our client, strongly suggesting that the contamination was due to petroleum inputs that occurred prior to our clients ownership of the facility.

Identifying Sources of Aviation Gas Contamination. A large Midwest supplier of aviation gasoline and jet fuel was wrongfully accused of shipping jet fuel-contaminated aviation gasoline to a commercial airport aviation fuel distributor. Immediately after being retained, Battelle collected samples of aviation fuel from terminals, delivery trucks, and on-site airport storage tanks and characterized the composition of the fuels. While Av Gas from the airport tanks was found to be contaminated with jet fuel, no other indications of jet fuel contamination were found in any part of the fuel delivery system from terminal to various airports. Working with expert engineers, it was found that malfunctions in the fuel handling system at the airport were responsible for jet fuel leaking into the Av Gas storage tanks. The case was settled favorably before trial.

Environmental Chemistry Specialist for environmental assessment studies for the *Exxon Valdez* oil spill. Working for Exxon USA, was a team member of the first group to immediately study the spill. Responsible for field study design, execution, mobilization, sample collection and subsequent in-laboratory analysis. Provided input to reports to government oversight agencies. Performed interlaboratory quality assurance checks to assure integrity of data used in NRDA assessments. Was principal author of Exxon USA's Revision 1.0 analytical methods used to support all subsequent *Exxon Valdez* litigation-level chemical analysis work in support of environmental damage assessments.

Determining Inputs Of Jet Fuel And Asphalt At a Major West Coast Airport. Reconstruction of jetways and jet parking pads at a large west coast international airport required that significant amounts of contaminated soil be removed, treated, and landfilled during runway renovation. The soils from the runway site were contaminated with a mixture of jet fuels, lube oils, and asphalt. Potentially responsible parties (jet fuel distributors, jet maintenance contractors, and asphalt contractors) requested Battelle to identify the hydrocarbon products present and allocate inputs of the various products in the soils in order to establish a basis for soil remediation cost-sharing. Using chemical fingerprinting and numerical principal component analysis (PCA), Battelle was able to accurately identify the products in the soils and confidently allocate proportional responsibility for total hydrocarbons in the contaminated soils. The sponsors of the work agreed with the findings of Battelle's report and used the results of the study to determine financial responsibility for cleanup.

Allen D. Uhler, Ph.D. (Continued)

Petroleum Product Identification: Tarballs In Valdez Harbor. Industrial-client sponsored project requiring the identification of the source of floating tarballs in the Port Valdez Harbor, AK. Using sensitive analytical techniques including triterpane and sterane biomarker measurement, determined that tarballs had the distinct signature of North Slope Crude oil and was not related to discharge of other types of oils from tankers in the Harbor. Wrote synoptic report for client used in negotiations with State Department of Environmental Conservation.

5-Year Multidisciplinary Environmental Assessment Study Of The Effects Of Petroleum Hydrocarbons In The Gulf Of Thailand. Senior scientist and project manager for a 5-year environmental assessment program for discharge of produced water and drill cuttings in the Gulf of Thailand for Unocal Thailand, Ltd. Assisted in the design of the field program and oversaw the analysis of sediments and water samples for trace metal and organic contaminants. Integrated chemical analysis results with benthic infauna data to estimate impacts of natural gas drilling activities, and produced a human health impact assessment report for consumption of fish from the Gulf. Presented results of study to two different Thai national government bodies during open public hearings.

Analytical Chemist For A Minerals Management Service (MMS) Project To Assess The Environmental Impact Of Spilled Oil And Copper From The Sunken Freighter *Pac Baroness* Near Point Conception, CA. Oversaw and directed chemical analysis of source materials and sediments from the accident site, and coauthored a report and peer-reviewed publication describing the environmental impact of the accident. Analysis of the sediments showed that fuel from the tanker spread in a non-uniformly distributed plume and in the general direction of the predominant current. The majority of the spilled fuel was found to be within about 500 m of the sunken freighter. Total hydrocarbon levels in the sediments within were about 100-times above background conditions, while total PAH were found to be more than 2000 times higher than background at the most severely contaminated sites. Fingerprinting of the distribution of parent and alkylated PAH in the impacted sediments clearly matched the source fuel mixture. However, evidence for rapid weathering of the fuel was observed, with the more water soluble 2-ring PAH and relatively unstable sulfur-containing dibenzothiophenes depleted in the sediments relative to the fresh fuel. Distributions of hydrocarbons from the spilled fuel was statistically correlated with changes in the macrofaunal community response in the sediments.

Project Manager/Senior Scientist: Fingerprinting Task Order Contract, Exxon Mobil Northeast Remediation Group. Battelle was selected by Exxon's Northeast Remediation Group to provide chemical fingerprinting, advanced chemical measurements, and professional consulting services in support of various environmental forensics investigations being carried out by the group. Dr. Uhler acts as the primary point of contact for the contract, assigns task orders to appropriate hydrocarbon chemists within Battelle's Environmental Forensics Group, and reviews laboratory and interpretative work products prepared in response to each task order assignment.

Allen D. Uhler, Ph.D. (Continued)

Publications

Feature Editor—Environmental Forensics, *Soil, Sediment, and Groundwater*

A.D. Uhler, S.A. Stout, R.M. Uhler, and K.J. McCarthy. May, 2000. Considerations for the accurate measurement of MTBE and other gasoline oxygenates.

Stout, S.A., A.D. Uhler, and K.J. McCarthy. February/March, 2000. Recognizing the confounding influences of 'background' contamination in "fingerprinting" investigation.

Uhler, A.D., S.A. Stout, and K.J. McCarthy. December/January, 2000. Manufactured gas plant process wastes and by-products: Part 2.

Uhler, A.D., S.A. Stout, and K.J. McCarthy. October/November, 1999. Understanding historic manufactured gas plant process wastes and by-products: Part 1.

Uhler, A.D. August/September, 1999. The IBC Forum on Environmental Forensics: a view from the cutting edge.

Stout, S.A., A.D. Uhler, and K.J. McCarthy. June/July, 1999. Biomarkers—Underutilized components in the forensic toolkit.

Uhler, A.D., S.A. Stout, and K.J. McCarthy. April/May, 1999. Improving petroleum remediation monitoring with forensic chemistry.

Stout, S.A., J.M. Davidson, K.J. McCarthy, and A.D. Uhler. February/March, 1999. Gasoline additives: usage of lead and MTBE.

Stout, S.A., A.D. Uhler, and K.J. McCarthy. January, 1999. "Fingerprinting" of gasolines.

Uhler, A.D., T.G. Naymik, and C.S. Eberle. November, 1998. A picture is worth a thousand words.

Stout, S.A., A.D. Uhler, and K.J. McCarthy. October, 1998. PAH can provide a unique forensic fingerprint for hydrocarbon products.

McCarthy, K.J., A.D. Uhler, and S.A. Stout. August/September, 1998. Weathering affects petroleum identification.

Uhler, A.D., K.J. McCarthy, and S.A. Stout. July, 1998. Get to know your petroleum types.

Naymik, T.J., A.D. Uhler, and K.J. McCarthy. June, 1998. Fate and transport analysis is a critical component in investigations.

Allen D. Uhler, Ph.D. (Continued)

McCarthy, K., A.D. Uhler, and S.A. Stout. May, 1998. Focused investigations can uncover true nature of contamination.

Uhler, A.D., S.A. Stout, and K.J. McCarthy. February/March, 1998. Site investigations must evolve.

Pertinent Peer-Reviewed Publications

Stout, S.A., W.P. Naples, A.D. Uhler, K.J. McCarthy, L.G. Roberts and R.M. Uhler. 2000. Use of Quantitative Biomarker Analysis in the Differentiation and Characterization of Spilled Oil. Proceedings 1998 Society of Petroleum Engineers International Conference on Health, Safety, and Environment, Stavanger, Norway. Paper No. 61460.

Stout, S.A. and A.D. Uhler. 2000. Chemical "fingerprinting" of highly weathered petroleum products. *Proceedings American Academy of Forensics Sciences*, Vol. VI, 82-83.

Uhler, A.D., S.A. Stout, R.M. Uhler, and K.J. McCarthy. 1999. Identification and differentiation of light- and middle-distillate petroleum for an NRDA using chemical forensics. Paper #118, *Proceedings 1999 International Oil Spill Conference*, Seattle WA.

S.A. Stout, A.D. Uhler, and K.J. McCarthy. 1998. Advanced chemical fingerprinting of sub-surface contamination—unraveling decades of contamination at a refinery. Proceedings National Petrochemical & Refiners Association Environmental Conference, November, 1998, Corpus Christi, TX. Paper #ENV-98-181.

Stout, S.A., A.D. Uhler, T. G. Naymik and K.J. McCarthy. 1998. Environmental Forensics: Unraveling Site Liability. *Environ. Sci. Technol.*, 32: 260A-264A.

Kelly, J.R., R.K. Kropp, A.D. Uhler, M.B. Zielinski, and Tawatchai S. 1998. Environmental response and recovery at drilling platforms in the Gulf of Thailand. Proceedings 1998 Society of Petroleum Engineers International Conference on Health, Safety, and Environment, Caracas, Venezuala. Paper No. 46478.

Peven, C.S. and A.D. Uhler. 1998. Trace organic analytical procedures. In Sampling and Analytical Methods of the National Status and Trends Program Mussel Watch Project: 1993-1996 Update. NOAA Technical Memorandum NOS/ORCA/CMBAD 130. National Oceanic and Atmospheric Administration, Silver Spring, MD.

Uhler, A.D., S.A. Stout, and K.J. McCarthy. 1998. Increase success of assessments at petroleum sites in 5 steps. *Soil and Groundwater Cleanup.* December/January, 1998.

Uhler, A.D. G.S. Durell, and M.S. Brancato. 1997. Determination of Butyltin Compounds in Seawater at the 1-Part-Per-Trillion Level. 1997. In Proceedings of the EPA 20th Annual Conference on Analysis of Pollutants in the Environment.

MARY D. BALCER, Ph.D.

CURRENT POSITION

Professor of Biology, Chair of Deptartment of Biology and Earth Sciences
Associate Research Scientist and Director of Lake Superior Research Institute
University of Wisconsin - Superior, PO Box 2000, Superior, WI 54880

EDUCATION

Ph.D. University of Wisconsin-Madison, Madison, Wisconsin. 1987. Zoology.
M.S. University of Wisconsin-Madison, Madison, Wisconsin. 1981. Zoology.
B.S. University of Wisconsin-Superior, Superior, Wisconsin. 1977. Biology and Chemistry.

SCIENTIFIC AND PROFESSIONAL INVOLVEMENT

International Association of Great Lakes Research
American Society of Limnology and Oceanography
American Fisheries Society

EMPLOYMENT HISTORY

1988 -Present **Lecturer, Assistant/Associate/Full Professor**, Biology Department, U. W.- Superior
Department Chair. 1995-present

Develop and instruct courses in Environmental Science, Ecology, and Limnology, supervise student research projects and advise students on academic issues. Conduct public education programs on University's research vessel. Develop aquatic education workshops for teachers Serve on University committees

1986-Present **Assistant/Associate Research Scientist**, Lake Superior Research Institute, U. W.- Superior
Director of Operations, Budget, and educational programs. 1994-present

Obtained over $2 million is externally funded research grants. Served as co-principal investigator on several field research projects, including: determining the effects of a chemical spill from a train derailment on the invertebrate community in the Nemadji River, south of Superior, WI; using populations of benthic invertebrates to assess the degree of sediment contamination in several streams in the U.S.; assessment of factors affecting walleye ova survival in the Lower Fox River (U.S. EPA); examination of sediment pollution in Green Bay and the Lower Fox River (U.S. EPA); determination of effects of mosquito control chemicals on benthic invertebrate communities of wetlands (MMCD), monitoring water quality of the Apostle Islands National Lakeshore (NPS); evaluating fish populations in the Duluth-Superior harbor of Lake Superior and examining populations of zooplankton in Western Lake Superior and other inland lakes (WI Sea Grant, WIDNR, U.S. F&WS). Other duties have included developing Aquatic Life Water Quality Advisories (U.S. EPA) and assessing Sediment Bioassay Techniques (U.S. Army Corps of Engineers). Current research projects include monitoring the spread and impact of exotic species in Lake Superior (ruffe, zebra mussels, and *Bythotrephes*) (NOAA/WI Sea Grant), assessing the toxicity of contaminated sediments, and evaluating the efficacy of ballast water treatment systems (NOAA, GLPF, EPA).

1983-1986 **Director of Programs at Lake Superior Field Station** - University of Wisconsin-Superior

Conducted educational programs aboard University's 63' research vessel. Emphasis was placed on sampling method and interpretation of field data to develop an understanding of aquatic ecosystems and food chain dynamics.

PUBLICATIONS

Glass, G.E., J.A. Sorenson, G.R. Rapp Jr., M.**Balcer**, and L. Schwarzkopf. 1999. Mercury Subsurface Maxima in Sediments: a Diagnostic for Anthropogenic Origin. pp. 467-485 in: Mercury Contaminated Sites: Characterization, Risk Assessment and Remediation. R. Ebinghaus, R.R. Turner, L.D. deLacerda, O.Vasiliev, and W. Salomons.(Eds.) Springer-Verlag, Berlin

Sibley, P.K., D.A. Benoit, M.D. **Balcer**, G.L. Phipps, C.W. West, R.A. Hoke, and G.T. Ankley. 1999. Design and Testing of a Bioassay Chamber for the *in situ* Assessment of Sediment Toxicity and Bioaccumulation Using Benthic Invertebrates.

Hoke, R.A., G.T. Ankley, P.A Kosian, A.M. Cotter, F.M. Vandermeiden, M. **Balcer**, G.L. Phipps, C. West, and J.S. Cox. 1997. Equilibrium partitioning as the basis for an integrated laboratory and field assessment of the impacts of DDT, DDE and DDD in sediments. Ecotoxicology 6(2): 101-110.

Liber, K., D,J. Call, T.P. Markee, K.L. Schmude, M.D. **Balcer**, F.W. Whiteman, and G.T. Ankley. 1996. Effects of acid-volatile sulfide on zinc bioavailability and toxicity to benthic macroinvertebrates: a spiked -sediment field experiment. Environmental Toxicology and Chemistry 15: 2113-2125.

Call, D.J., K. Lodge, T.P. Markee, M.D. **Balcer,** G.T. Ankley and P.D. Cook. 1996. Organic carbon and chemical contaminant relationships in river and lake sediments. SETAC 17th Ann. Mtg.Abs. Book, p.173.

Whiteman, F.W., G.T. Ankley, M.D. Kahl, D.M.Rau, and M.D. **Balcer**. 1996. Evaluation of Interstitial Water as a Route of Exposure for ammonia in sediment tests with benthic macroinvertebrates. Environmental Toxicology and Chemistry 15:794-801.

Ankley, G.T., K. Lodge, D.J. Call, M.D. **Balcer**, L.T. Brooke, R.D. Johnson, P.M. Cook, R.G. Kreis, Jr., A.R. Carlson, G.J. Niemi, R.A. Hoke, C.W. West, J.P. Giesy and P.D. Jones. 1992. Integrated assessment of contaminated sediments in the Lower Fox River and Green Bay, Wisconsin. Ecotoxicol. Environ. Safety 23:46-63.

Balcer, M.D. 1988. Ecology of the crustacean zooplankton and young-of-the-year rainbow smelt populations of Western Lake Superior. Ph.D. Thesis. University of Wisconsin-Madison. 96 pp.

Balcer, M.D., N.D. Korda and S.I. Dodson. 1984. Zooplankton of the Great Lakes: A guide to the identification and ecology of the Common Crustacean Species. The University of Wisconsin Press, Madison. 174 pp.

REPORTS

Balcer, M.D., K. L. Schmude, J. Snitgen, and A. Lima. 1999. Long-term Effects of the Mosquito Control Agents Bacillus Thurengiensis Israelensis (Bti) and Methoprene on Non-target Macroinvertebrates in Wetlands in Wright County, MN (1997-1998). Final Report to Minneapolis-St. Paul Metropolitan Mosquito Control District.

Sorenson, J., G. Glass, M. **Balcer,** and L. Schwarzkopf, 1998. Mercury Contamination Assessment and Tests for Mitigation of Contaminated Reservoir Sediments in the Lower St. Louis River. Final Report to US EPA Great Lakes National Program Office - Grant No. 995478.

Call, D., M. TenEyck, I. Ndbari, D. Fritsche, D. Brooke, K. Schmude and M. **Balcer**. 1998. Toxicity Evaluation of Sediments from Chequamegon Bay, Lake Superior, at Ashland, Wisconsin. Final Report to Short Elliott Hendrickson Inc. Chippewa Falls, WI.

Schmude, K.L., M.D. **Balcer** and A. Lima. 1998. Long-term Effects of the Mosquito Control Agents Bacillus Thurengiensis Israelensis (Bti) and Methoprene on Non-target Macroinvertebrates in Wetlands in Wright County, MN (1997). Final Report to Minneapolis-St. Paul Metropolitan Mosquito Control District.

Balcer, M.D. 1992. Assessment of benthic invertebrate populations in the Nemadji River, Burlington-Northern railcar derailment. Final Report to Summitt Envirosolutions, Inc., Minneapolis, MN. Contract No. 921680.

Call, D.J., M.D. **Balcer,** L.T. Brooke, S. Lozano, and D.D. Vaishnav. 1991. Sediment Quality Evaluation in the Lower Fox River and Southern Green Bay of Lake Michigan. Final Report to U. S. Environmental Protection Agency, Cooperative Agreement CR-815232 to the University of Wisconsin-Superior, Superior, WI.

Balcer, M.D. 1989. Cross Channel Hole and Bunge Slip Fish Assessment. Final Report to the Northwest Regional Planning Commission.

Balcer, M.D., D.J. Call, T.P. Markee, and S.H. Poirier. 1989. Evaluation of Biological Responses of Organisms to Exposure to Sediments from Great Lakes Harbors. Final Report to the U.S. Army Corps of Engineers, St. Paul District. Contract Number DACW37-89-M-0669.

U.S. Environmental Protection Agency and University of Wisconsin-Superior. 1989. Effects, Persistence and Distribution of Esfenvalerate in Littoral Enclosures. Deliverable 7592 A : Report on Field Validation of Enclosure Protocols for Evaluating Pesticides in Natural Waters. (Co-Authored sections on Macroinvertebrate Studies).

Balcer, M.D. and D.J. McCauley. 1989. Water resources of the Apostle Islands National Lakeshore 1986-1988. Final Report to the U.S. Department of the Interior, National Park Service. Contract No. CX600-5-0065.

Balcer, M.D., D.J. McCauley, G.J. Niemi, and L.T. Brooke. 1986. Ecological assessment of factors affecting walleye ova survival in the Lower Fox River. Final Report to U.S. EPA, ERL-Duluth, Cooperative Agreement CR-811723-02-0.

KURT L. SCHMUDE, Ph.D.

CURRENT POSITION

Associate Scientist
Lake Superior Research Institute, University of Wisconsin - Superior
1800 Grand Avenue, Superior, Wisconsin 54880

EDUCATION

Ph.D. University of Wisconsin-Madison. 1992. Entomology. Minor: Aquatic Ecology (Distributed)
M.S. University of Wisconsin-Madison. 1984. Entomology.
B.S. University of Wisconsin-Oshkosh. 1982. Biology. Emphases: Zoology, Ecology.

SCIENTIFIC AND PROFESSIONAL INVOLVEMENT

North American Benthological Society
American Entomological Society
Entomological Society of America
Ohio Biological Survey
Entomological Society of Washington
Michigan Entomological Society
Dragonfly Society of America

EMPLOYMENT HISTORY

1999-Present **Associate Scientist**
Lake Superior Research Institute (LSRI), UW-Superior

1. Designed, implemented, processed samples, and analyzed data for the 2nd year of a study that examined the impacts of leachate from a closed landfill on the benthic macroinvertebrate fauna of an impacted stream/wetland in Rhinelander, WI. (Wisconsin Department of Natural Resources - WI DNR)

2. Designed, implemented, processed samples, and analyzed data for a study to determine the effects of removing dams on the macroinvertebrate fauna in streams of Wisconsin. (WI DNR)

3. Surveyed the aquatic macroinvertebrate fauna in the Niagara Escarpment of Door County, WI, the Wolf River Geographic Management Unit, WI, and the Flambeau River State Forest, WI. (WI DNR)

4. Provided expert taxonomic identifications for the following projects:
   - midge larvae (Chironomidae) from streams along the north shore of Lake Superior for Minnesota's biocriteria-development project. (Minnesota Pollution Control Agency - MPCA)
   - aquatic macroinvertebrates from Lake Superior and its tributaries for several U.S. EPA projects. (Private consulting firm)
   - aquatic macroinvertebrates for a project that assessed the effects of creosote contamination in a stream in Superior, WI. (Private consulting firm)
   - aquatic macroinvertebrates for the Bad River Tribe of Indians, WI, for their environmental monitoring program.
   - aquatic macroinvertebrates for the surveys conducted on state-owned properties mentioned in #3 above. (WI DNR)

5. Collected, processed, and analyzed benthic macroinvertebrate samples from a stream contaminated with oil-refinery effluent in Superior, WI. (WI DNR)

6. Processed benthic macroinvertebrate samples for the Oneida Tribe of Indians of Wisconsin as part of their environmental monitoring program.

1995-1999 **Assistant Scientist**
Lake Superior Research Institute (LSRI), UW-Superior

1. Designed a study, and processed and analyzed samples that determined the impacts of deicing compounds from the Milwaukee County Airport, WI, on the benthic macroinvertebrate fauna of an impacted creek. (U.S. Geological Survey)

2. Designed, implemented, processed the samples, and analyzed the data for a study that examined the impacts of leachate from a closed landfill on the benthic macroinvertebrate fauna of an impacted creek, river, and wetland in Rhinelander, WI. (WI DNR)

3. Five separate studies that involved processing and expert identification of aquatic macroinvertebrates to determine community composition for several streams impacted by various perturbations in Wisconsin. (WI DNR)

4. Three separate studies that involved processing and expert identification of macroinvertebrates to determine the community composition at several contaminated sites within the Duluth-Superior Harbor of Lake Superior. (WI DNR and MPCA)

5. Involved in three separate projects that determined the effects of *Bacillus thuringiensis* var. *israelensis* (Bti) and methoprene on nontarget aquatic macroinvertebrates in Minnesota wetlands. (Minnesota Metropolitan Mosquito Control District)

6. Determined the effects of vertical retaining walls and rock riprap along shorelines of lakes on the macroinvertebrate community to assist the Wisconsin DNR in developing a shoreline enhancement policy for landowners.

7. Surveyed and/or identified the aquatic macroinvertebrates of the Brule River State Forest, Black River State Forest, Meadow Valley Wildlife Area, and the Lake Superior Watershed in Wisconsin for rare and endangered species and communities. (WI DNR)

8. Processed benthic macroinvertebrate samples and identified organisms for an Ecological Risk Assessment study on a contaminated site in Ashland Harbor, Lake Superior. (Private consulting firm)

1992-1995 **Associate Researcher**
LSRI at UW-Superior

1. Processed samples and identified macroinvertebrates from the Duluth Superior Harbor of Lake Superior for Characterization of Contamination and Coastal Zone Management projects. (WI DNR)

2. Determined effects and fate of contaminants in aquatic environments. The chemicals listed below were studied in a pond/mesocosm system as separate 1-2 year projects funded by the U.S. EPA.
   - diflubenzuron (insect growth regulator): 1992
   - nonylphenol (industrial surfactant): 1993-1994
   - trifluralin (herbicide): 1994-1995
   - zinc: 1993-1994
   - fluoranthene (polycyclic aromatic hydrocarbon, PAH): 1994

3. Processed benthic samples and identified macroinvertebrates to determine the effects of a benzene spillage from a train derailment in the Nemadji River, Superior, WI.

PUBLICATIONS

Schmude, K.L. 1999. Riffle beetles in the genus *Stenelmis* (Coleoptera: Elmidae) from warm springs in southern Nevada: new species, new status, and a key. Entomological News 110: 1-12.

Liber, K., K.L. Schmude, and D.M. Rau. 1998. Toxicity of *Bacillus thuringiensis* var. *israelensis* to chironomids in pond mesocosms. Ecotoxicology 7: 343-354.

Schmude, K.L., K. Liber, T.D. Corry, and F.S. Stay. 1999. Effects of 4-nonylphenol on benthic macroinvertebrates and insect emergence in littoral enclosures. Environmental Toxicology and Chemistry 18: 386-393.

Schmude, K.L., J.J. Jennings, K.J. Otis, and R.R. Piette. 1998. Effects of habitat complexity on macroinvertebrate

colonization of artificial substrates in north temperate lakes. Journal of the North American Benthological Society 17: 73-80.

Crane, J.L., M. Schubauer-Berigan, and K.L. Schmude. 1997. Sediment assessment of hotspot areas in the Duluth/Superior Harbor. U.S. EPA, Great Lakes National Program Office. EPA-905-R97-020.

Liber, K., K.L. Schmude, and T.D. Corry. 1996. Effects of the insect growth regulator diflubenzuron on insect emergence within littoral enclosures. Environmental Entomology 25: 17-24.

O'Halloran, S.L., K. Liber, K.L. Schmude, T.D. Corry. 1996. Effects of diflubenzuron on benthic macroinvertebrates in littoral enclosures. Archives of Environmental Contamination and Toxicology 30: 444-451.

Liber, K., D.J. Call, T.P. Markee, K.L. Schmude, M.D. Balcer, F.W. Whiteman, and G.T. Ankley. 1996. Effects of acid-volatile sulfide on zinc bioavailability and toxicity to benthic macroinvertebrates: a spiked-sediment field experiment. Environmental Toxicity and Chemistry 15: 2113-2125.

Schmude, K.L., C.B. Barr, and H.P. Brown. 1992. *Stenelmis lignicola* and *Stenelmis xylonastis*, two new wood-inhabiting riffle beetles in North America (Coleoptera: Elmidae). Proceedings of the Entomological Society of Washington 94:580-594.

Hilsenhoff, W.L. and K.L. Schmude. 1992. Riffle beetles of Wisconsin (Coleoptera: Dryopidae, Elmidae, Lutrochidae, Psephenidae) with notes on distribution, habitat, and identification. The Great Lakes Entomologist 25:191-213.

Schmude, K.L. and W.L. Hilsenhoff. 1991. *Stenelmis maerkelii* Motschulsky and *S. vittipennis* Zimmermann as synonyms of *S. bicarinata* LeConte (Coleoptera: Elmidae). Proceedings of the Entomological Society of Washington 93: 756-759.

Schmude, K.L. and H.P. Brown. 1991. A new species of *Stenelmis* (Coleoptera: Elmidae) found west of the Mississippi River. Proceedings of the Entomological Society of Washington 93: 51-61.

Lillie, R.A., K.L. Schmude, and W.L. Hilsenhoff. 1987. Rediscovery of *Acanthametropus pecatonica* in the western Great Lakes region (Ephemeroptera: Siphlonuridae). The Great Lakes Entomologist 20: 85-86.

Schmude, K.L. and W.L. Hilsenhoff. 1986. Biology, ecology, larval taxonomy, and distribution of Hydropsychidae (Trichoptera) in Wisconsin. The Great Lakes Entomologist 19: 123-145.

PERTINENT REPORTS

Schmude, K.L. 1999. Analysis of the macroinvertebrate community in the Slaughterhouse Creek system, Rhinelander, Wisconsin - Spring 1999. Final Report submitted to the Wisconsin Department of Natural Resources, Superior, WI.

Schmude, K.L. 1998. Analysis of the macroinvertebrate community in the Slaughterhouse Creek system and Pelican River, Rhinelander, Wisconsin - Spring 1998. Final Report submitted to the Wisconsin Department of Natural Resources, Superior, WI.

Schmude, K.L. 1999. Aquatic macroinvertebrate biotic field surveys and taxonomy: Meadow Valley Wildlife Area, Black River State Forest, Brule River State Forest, Wolf River Geographic Management Unit (GMU), Niagara Escarpment. Final Report to the Wisconsin Department of Natural Resources, Bureau of Endangered Resources. Lake Superior Research Institute, University of Wisconsin-Superior.

Balcer, M.D., K.L. Schmude, and J. Snitgen. 1999. Long-term effects of the mosquito control agents *Bti (Bacillus thuringiensis israelensis)* and methoprene on non-target macroinvertebrates in wetlands in Wright County, Minnesota (1997-1998). Final Report to Metropolitan Mosquito Control District, St. Paul, MN. Lake Superior Research Institute, University of Wisconsin-Superior, Superior, WI. 144 pp.

Call, D., M. TenEyck, I. Ndbari, D. Fritsche, D. Brooke, K. Schmude, and M. Balcer. 1998. Toxicity evaluation of sediments from Chequamegon Bay, Lake Superior, at Ashland, Wisconsin. Final Report to Short Elliott Hendrickson Inc (SEH). Lake Superior Research Institute, University of Wisconsin-Superior, Superior, WI. 88 pp.

Schmude, K.L. and M.D. Balcer. 1997. Effects of the mosquito control agents Bti (Bacillus thuringiensis israelensis)and methoprene on non-target macroinvertebrates in wetlands in Wright County, Minnesota (1997). Final Report to Metropolitan Mosquito Control District, St. Paul, MN. Lake Superior Research Institute, University of Wisconsin-Superior, Superior, WI. 186 pp.

Schmude, K., M. Jennings, K. Otis, and R. Piette. 1996. Invertebrates, pp. 49-61. *In:* Shoreline Protection Study. A Report to the Wisconsin State Legislature. Wisconsin Dept. of Natural Resources, PUBL-RS-921-96.

Moffett, M.F., L.E. Anderson, T. Corry, M.P. Hanratty, L.J. Heinis, M.L. Knuth, K. Liber, S.L. O'Halloran, K.L. Schmude, F.S. Stay, and D.K. Tanner. 1995. Effects, persistence and distribution of diflubenzuron in littoral enclosures. Final Report 2898. U.S. EPA, Mid-Continent Ecology Division, Duluth, MN. 501 pp.

Schmude, K.L. 1995. Rare aquatic macroinvertebrate (insects) survey of the Northern Highland - American Legion State Forest (NHALSF). Final Report to Wisconsin Department of Natural Resources, Bureau of Endangered Resources. Lake Superior Research Institute, University of Wisconsin-Superior, Superior, WI. 30 pp. + 6 figs.

RICHARD GEORGE FOX – SEDIMENT QUALITY SPECIALIST

EDUCATION

M.S., Oceanography, 1988, Texas A&M University
B.S., Chemistry, 1984, University of Wisconsin–Madison
B.S., Geology and Geophysics, 1984, University of Wisconsin–Madison

PROFESSIONAL MEMBERSHIPS

Member, Federation of Environmental Technologists
Member, Western Dredging Association
Member, Society of Environmental Toxicology and Chemistry

PROFESSIONAL WATERFRONT AND SEDIMENT EXPERIENCE

Richard (Rick) Fox has over eleven years of experience working on issues related to contaminated sediments and their impacts. As a member of Hart Crowser's sediment practice group in the Northeast and Great Lakes region, his responsibilities include determining sediment and water quality, characterizing and assessing sediment contamination, designing remedial strategies, and negotiating the successful implementation of those strategies with regulatory agencies. Recent projects include managing work on the development of remediation and restoration efforts for former manufactured gas plant facilities and a former wood treating facility. Formerly an environmental scientist in the EPA's Great Lakes National Program Office, Mr. Fox was a lead coordinator for the Assessment and Remediation of Contaminated Sediments (ARCS) program. He also served as a member of the EPA's Lake Superior Regional Team and was the remedial action coordinator for the Waukegan Harbor assessment and remediation. In work as a consulting organic chemist, Mr. Fox prepared a detailed QA/QC guidance manual for use by the Puget Sound Dredged Disposal Analysis (PSDDA) program and the Washington State Department of Ecology.

REPRESENTATIVE WATERFRONT AND SEDIMENT PROJECT EXPERIENCE

Confidential Former Wood Treating Facility, Great Lakes Region (1997-ongoing). Mr. Fox is reviewing data collected from a stream contaminated with wood treating residuals in order to determine what remedial actions, if any, are necessary. If necessary, further data will be collected to evaluate potential risk pathways.

Port of Richmond, California (1997). Mr. Fox evaluated data from a shipyard scrap site to determine whether there is an ecological or regulatory need for removal of impacted sediments.

Norfolk Steel, Norfolk, Virginia (1997). Hart Crowser performed site risk assessments for both on-site and off-site impacts of a steel manufacturing property which was for sale. Mr. Fox is responsible for performing baseline ecological and human health risk assessments for the adjacent river area. This information is critical for the sale of the property. Efforts were coordinated with Virginia Department of Environmental Quality and EPA.

Wisconsin Manufactured Gas Plant Sites (1996-ongoing). Hart Crowser is assisting a soil remediation firm in its review of data generated by the analysis of contaminated sediments located adjacent to several former manufactured gas plants. Mr. Fox is responsible for reviewing the sediment characterizations performed for five sites and estimating the volume of contaminated sediments that require remediation at each site. This information will be used to proposed remedial alternatives for sediments impacted by coal tar.

Fox River, Green Bay, Wisconsin (1996-ongoing). Mr. Fox is working on the development of remediation and restoration options for a major PCB-contaminated river system in the Great Lakes region. He is

responsible for reviewing existing data, assessing the risk posed by the contaminated sediments, and aiding in the execution of a sequential risk mitigation on the river system.

Participant of the Sediment Advisory Group (1994-ongoing). Mr. Fox is a member of an advisory group which develops and evaluates sediment quality guidelines (SQGs). The SQGs are empirically derived from data bases which contain synoptically collected chemical and biological data. These data bases are then used to develop SQGs which predict expected biological effects based on chemical results. The group recently taught a short course at the 18th Annual Meeting of the Society of Environmental Toxicology and Chemistry in San Francisco.

Newburgh Lake Restoration, Rouge River, Livonia, Michigan (1996-ongoing). Mr. Fox is responsible for writing the environmental monitoring plan (EMP) for this restoration of a 105-acre impoundment, which will include rehabilitation of the dam that forms the impoundment, dewatering of the lake, and the subsequent removal of 600,000 cubic yards of sediments, some of which are contaminated with up to 50 parts per million of PCBs. The EMP will describe the sampling and analysis required to ensure that sediment removal actions meet restoration goals.

Birmingham Steel, Cartersville, Georgia (Summer, 1997). Mr. Fox performed sediment sampling of two closed-circuit retaining ponds to determine the effects of plant processes on the pond sediments. This information was critical to close the sale of the mill.

U.S. Environmental Protection Agency (EPA), Great Lakes National Program Office (1990-1996). During his employment as an EPA environmental scientist, Mr. Fox was responsible for numerous technical programs related to sediment quality. As a member of the Lake Superior Regional Team, Mr. Fox provided technical review of the Lake Superior Lakewide Management Plan and interacted with all the affected stakeholders. As remedial action coordinator for Waukegan Harbor, Mr. Fox worked extensively with the Waukegan Citizen's Advisory Group to coordinate assessment activities and develop a remedial action plan that was both technically sound and acceptable to regulators and other stakeholders. Mr. Fox also served as a lead assessment coordinator for the ARCS program, with responsibilities that included managing analytical services, reviewing quality assurance project plans, conducting field and laboratory audits, and validating data. He was chair of the ARCS toxicity/chemistry work group and an author and the primary editor of the "ARCS Assessment Guidance Document." This comprehensive work recommends procedures for collecting sediment samples, performing chemical (including screening-level) analyses, testing for toxicity, analyzing benthic communities, and evaluating data quality. In addition, Mr. Fox served as project officer for two grants to the Minnesota Pollution Control Agency for a detailed, integrated sediment assessment at the St. Louis River under the approach developed by the ARCS program. Mr. Fox also acted as project officer for grants awarded to the Fond du Lac Tribe (to survey mercury contamination in St. Louis River reservoirs); to the University of Minnesota (to monitor concentrations of atrizine and its metabolites in Great Lakes open water); Pennsylvania Department of Environmental Resources (for work with EPA Region III to characterize sediment contamination in Presque Isle Bay, PA), and to the Ohio Environmental Protection Agency (for a screening-level assessment of sediment contamination in the Maumee river and bay using immunoassay techniques). In recognition of his contributions to the ARCS program, Mr. Fox was awarded the EPA's Bronze Medal for Meritorious Service in 1992.

PTI Environmental Services, Bellevue, Washington (1989-1990). Working as an environmental chemist, Mr. Fox prepared a detailed QA/QC guidance manual for use by the PSDDA program and the Washington State Department of Ecology. In addition, he coordinated review and validation of semivolatile organic, chlorinated pesticide, dioxin, and trace metal data for numerous projects. Mr. Fox also assisted in preliminary Natural Resource Damage Assessments in Elliott Bay (Washington), San Francisco Bay, and the Palos

Verdes Shelf (California) and determined Washington's background concentrations of selected contaminants in groundwater, soil, fresh and marine surface waters, freshwater and marine sediments, and air.

PUBLICATIONS AND PRESENTATIONS ON WATERFRONT AND SEDIMENT TOPICS

Instructor, 18th Annual Meeting of the Society for Environmental Toxicology and Chemistry, San Francisco, California ("Use of Sediment Quality Guidelines in the Assessment and Management of Contaminated Sediments"). November 16, 1997.

Editor, issue of the *Journal of Great Lakes Research* dedicated to the EPA's Assessment and Remediation of Contaminated Sediments program. 1996.

Fox, R. G., D. Dennis-Flagler, D. C. Cowgill, S. Garbaciak, M. L. Tuchman, E. A. Crecelius, C. G. Ingersoll, and G. A. Burton. "Integrated Sediment Assessment Approach of the U.S. Assessment and Remediation of Contaminated Sediments (ARCS) Program." *Proceedings for Sediment Remediation '95.* Windsor, Ontario. May 8-10, 1995.

Fox, R. G., D. Cowgill, S. Garbaciak, E. A. Crecelius, C. G. Ingersoll, and G. A. Burton. "Integrated Sediment Assessment Approach of the United States Environmental Protection Agency's Assessment and Remediation of Contaminated Sediments (ARCS) Program." *Proceedings of the Characterisation and Treatment of Sludge (CATS II) Congress.* Antwerp, Belgium. November 15-17, 1993.

Instructor, Fourteenth Annual Meeting of the Society for Environmental Toxicology and Chemistry, Houston, Texas ("Assessment of Contaminated Sediment"). November 14, 1993.

Fox, R. G., E. A. Crecelius, C. G. Ingersoll, and G. A. Burton. "Integrated Sediment Assessment of Saginaw Bay, Michigan, for the ARCS Program." Presented at the First International Specialized Conference on Contaminated Aquatic Sediments, International Association on Water Quality. Milwaukee, Wisconsin. June 14-16, 1993.

Convener and Session Chair, "Progress in the Assessment and Remediation of Contaminated Sediments (ARCS) Program," Thirty-sixth Conference on Great Lakes Research, Green Bay, Wisconsin. June 6-10, 1993.

Instructor, University of Wisconsin–Madison, College of Engineering, Engineering Professional Development Course ("Managing Contaminated Sediment"). April 13-15, 1993.

McDonald, T. J., M. C. Kennicutt II, J. K. Rafalska, and R. G. Fox. "Source and maturity of organic matter in selected Prydz Bay sediments, Site 739C and Site 731A, ODP Leg. 119." In Barron, J., B. Larson, et al. *Proceedings of the Ocean Drilling Program, Scientific Results 119.* College Station, Texas (Ocean Drilling Program), pp. 407-416.

Erik Anderson, Ph. D.

Education

Ph.D., Civil Engineering
University of Minnesota

Masters of Science
Civil and Environmental Engineering, University of Wisconsin Madison (1990)

Bachelor of Science
Civil and Environmental Engineering, University of Wisconsin Madison (1988)

Professional Associations

American Geophysical Union

Tau Beta Pi, National Engineering Honor Society

General Background

Design engineer for dam rehabilitation and flood control projects. Training and experience with surface and groundwater computer models including TR-20, HEC-1, HEC-2, WSPRO, DAMBRK, SLAEM and MLAEM. Master's research work included analytical/numerical modeling of seepage beneath dams and doctorate research work included development of analytical modeling techniques for groundwater applications.

Experience

Dam Repair

Prepared grant applications for the State Dam Repair Fund for Wisconsin municipally owned dams including Skinner Dam (Langlade County), Albany dam, Bloomer Mill Dam, Marion Mill Dam, Mishicot Dam, Svetlik Mill Dam (Cadott), Lake Tomah Dam, and Village of Oxford Dam. Documentation includes hydrologic/hydraulic analyses, dam-failure analyses and floodplain mapping, stability and seepage analyses, preliminary design of spillway modifications and cost estimates. All applications were accepted for funding of 50% of project costs up to $200,000. Work upon obtaining grants has included final design, preparation of construction plans and specifications, and inspection.

Floodplain Studies

Hydrologic and hydraulic modeling of rivers to delineate regulatory flood plains for local zoning and federal insurance requirements. All studies meet State and Federal standards. Projects include:

Albany Dam and Floodplain Revisions – Albany, Wisconsin. Performed hydrologic and hydraulic analyses for dam rehabilitation project. Results indicated a significant reduction in 100-year flood elevations for floodplain zoning was allowable. Prepared analyses meeting Wisconsin DNR and FEMA requirements for revising the Albany Flood Insurance Study. Prepared and submitted all supporting information for the FEMA Letter of Map Revision.

Badger Mill Creek – Madison, Wisconsin. Updated floodplain mapping for rapidly urbanizing portion of Dane County. Hydrologic/hydraulic studies quantified effects of past developments in the watershed and predicted long-term hydrologic effects of complete urbanization. Developed plans for channelization to confine floodplain. Supporting documentation prepared for submittal to Wisconsin DNR and FEMA.

Black River Falls, Wisconsin. Failure of the city levee resulted in flooding of over 90 homes. Performed emergency hydrologic and hydraulic analyses to evaluate deficiencies in the existing Flood Insurance Studies and to be used in the design of a new levee. All analyses submitted for review by WDNR, FEMA and U.S. Army Corps of Engineers.

Flood Control Projects

Hydrologic and hydraulic analyses, flood routing, dam-failure analyses, floodplain mapping. Structure design and layout, channel protection and lining design, filter design and seepage analyses. Projects include:

Black River Falls Flood Control – Black River Falls, Wisconsin. Performed emergency hydrologic and hydraulic analyses for reconstruction of failed levee.

Winding Creek Fish Rearing Station (Phase II) – State of Wisconsin. Performed hydrologic and hydraulic analyses and developed plans and specifications for construction of earth dam and flood diversion channel.

Groundwater Modeling

Develop regional groundwater models to evaluate wellhead protection, water supply and water quality issues. Projects include:

Wellhead Protection Plan – Cadott, Wisconsin. Created regional groundwater model to evaluate capture zones for the municipal well field and answer questions about potential impacts of a proposed gravel pit. The well field lies in a highly permeable alluvial valley bounded by the Yellow river and a relatively less permeable sandstone formation. Results showed that simple analytical methods previously used to delineate capture zones at the site were not adequate. Work included evaluation of a water budget for region, evaluating existing information- including pumping tests, well logs, and surface water records-and model development, calibration, and field evaluation.

Wellhead Protection Plan – Edina, Minnesota. Provided modeling guidance and quality control for delineating wellhead protection zones for the City of Edina municipal wells. Work included refining existing groundwater model of Hennepin County and creating a new model of the Mt. Simon-Hinkley Aquifer.

Groundwater Flooding Control – Town of Kronenwetter, Wisconsin. Developed model to evaluate groundwater flooding problems. Evaluated the feasibility of installing drain tile networks to lower the water table and evaluated the potential impacts on a proposed municipal well. Developed a preliminary design of the drain tile network with cost estimates. Prepare maps of the zone of influence of the drain tile.

Paynesville Wellhead Protection – Paynesville, Minnesota. Responsible for QA/QC of groundwater model (MLAEM/2). Provide technical assistance and expertise with software and computer configuration issues.

Modeling Capture Zones of Groundwater Wells using Analytic Elements – U.S. Environmental Protection Agency (USEPA). Co-author/investigator USEPA CZAEM. The objective of this project was to develop algorithms for determining, in relatively simple settings, the envelopes of capture zones of wells. The CZAEM program fully computes

and displays the boundaries of the capture zone envelope, subzones, and time zones, including dividing streamlines and stagnation points for any well in the flow field.

Altoona Sediment Reduction Plan – Altoona, Wisconsin. Developed model of proposed infiltration basin to evaluate potential environmental problems associated with high recharge rates. Set design parameters for basin based on limiting groundwater conditions.

Bridge Hydraulics

Hydrologic analyses to determine flood frequency for bridge replacement projects. Preliminary bridge design including hydraulic analyses, bridge sizing and selection.

Research at the University of Minnesota

Analytic Element Modeling of Coastal Aquifers. EPA funded project to develop techniques for large scale modeling of variable density groundwater flow.

Analytic Element Modeling of Yucca Mountain, Nevada. Developed a regional groundwater model covering most of the State of Nevada. Project was funded by the USGS and the Department of Energy. The purpose of the work was to verify the artificial boundary condition of existing smaller scale models of the proposed high-level nuclear-waste repository at Yucca Mountain, Nevada.

Groundwater – Surface Water Interaction. Developed modeling guidelines for including the local details of groundwater-surface water interaction within the regional groundwater models. Project was funded by the State of Minnesota to provide tools for regulators to evaluate impacts of high capacity irrigation wells or nearby rivers.

Publications

Analytic Element Modeling of Yucca Mountain, Nevada, by M. Bakker, E. I. Anderson, T. N. Ohlstoorn, and O. D. L. Strack, Special Edition of the Journal of Hydrology, currently in publication.

CZAEM Users Guide – Modeling Capture Zones of Groundwater Wells Using Analytic Elements, O. D. L. Strack, E. I. Anderson, M. Bakker, W. C. Olsen, J. C. Panda, R. W. Dennings, D. R. Steward, EPA Document EPA/600/R-94/174, September 1994.

Roger A. Clay, P.E., P.H. — Project Manager

Education

Masters of Science
Civil and Environmental Engineering, University of Wisconsin (1987)

Masters of Science
Water Resources Management, University of Wisconsin (1981)

Bachelor of Science
Water Resources
University of Wisconsin Stevens Point (1977)

Professional Registration

Professional Engineer in Wisconsin, Minnesota, Washington, Alaska, Oregon

Professional Hydrologist in Wisconsin

Professional Associations

American Society of Civil Engineers

American Water Resources Association

General Background

Senior project manager with experience that includes storm water management, NPDES permitting, hydrology studies, watershed management, surface water hydraulics, hydropower analysis and licensing, water supply and groundwater investigations. Complementing this experience is significant involvement in water quality management, monitoring and modeling projects. Has participated in and led interdisciplinary teams for environmental impact, mitigation or remediation projects. Experience also includes preparation of plans and specifications for water resources projects.

Continuing Education

Project Management, HDR, 1995; Woodward-Clyde Consultants, 1991
Effective Motivational Management, LMI, 1993
Constructed Wetlands for Stormwater Quality Enhancement, University of Washington, 1994
Biofiltration Systems, University of Washington, 1993
Design Professionals and the Law, WSBA, 1993
Cold Regions Engineering, University of Washington, 1991
Mountain Climatology, University of Colorado, Boulder, 1985
Urban Storm Water Quality Management, ASCE, 1990
Hydrologic Applications of Remotely Sensed Data, U.S.G.S., 1982
Satellite Data Collection Systems, U.S. Geological Survey, 1978

Experience

Storm Water Management

Storm Water Pond Design – Rogers, Minnesota. Complete the hydrologic and hydraulic analysis for a series of six storm water ponds in an urbanizing commercial and industrial area within Rogers, Minnesota. Used XPSWMM to model the six ponds which control runoff rates and quality in the northeastern area of the City of Rogers.

Lake Level Control – Burnsville, Minnesota. Complete a hydraulic analysis of water levels in a series of seven lakes in Burnsville, Minnesota to identify means of managing chronic high water. Implement XPSWMM to determine hydraulic characteristics of the lakes and lake level control structures. Prepare recommendations for managing lake water levels by the City of Burnsville.

Chippewa County, Wisconsin. Prepared a Storm Water Management Plan (Plan) for the approximately one square mile Chippewa County Farm complex which is presently in the planning stages for development. The purpose of the Plan was to provide the basis for both surface and groundwater management in the County Farm complex. The complex is presently in agricultural or open space land uses but will be sold and developed in the next 10 years. The area is sensitive to development since site soils are relatively permeable and because the area is also within the 5-year zone of contribution to the East Well Field operated by the City of

Chippewa Falls. It is therefore of extreme importance that development proceed with strict protection of surface runoff rates, surface water quality, groundwater recharge and groundwater quality. The project involved delineation of the subwatersheds that exists within the County Farm complex and developing runoff rates for existing and anticipated build out conditions using SCS methodology. Estimated runoff rates were then used in concert with anticipated future development to recommend appropriate best management practices to protect both surface and groundwater resources both within the County Farm complex and in off site areas potentially impacted by development within the County Farm.

Weyerhaeuser Corporation. Served as in-house consultant on NPDES storm water permitting issues for a three year period. Conducted regional training workshops, reviewed monitoring plans and permit applications, prepared guidance document for preparation of storm water pollution prevention plans, developed template storm water pollution prevention plans. Provided technical assistance on selection and implementation of storm water best management practices at saw mills, log sort yards, engineered fiber products facilities, landfill operations, recycling facilities, transportation facilities, and paper mills. Provided engineering review of storm water management facilities. Prepared and reviewed Spill Prevention Control and Countermeasures Plans.

Yellow River Flood Insurance Study – Burnett County, Wisconsin. Technical manager for the creation of a 100-year floodplain map of a 30-mile reach of the Yellow River, a project being completed for the Federal Emergency Management Agency. The project involves computing peak discharge rates with HEC-1, completing the hydraulic analysis of the river and mapping of the 100-year floodplain with Boss-RMS, and preparing a flood insurance study report

Water Quality Projects

Ladysmith, Wisconsin. Project manager and principal investigator for development of the Corbett Lake Management Plan. Corbett Lake is a 35 acre lake lying entirely within the City of Ladysmith and which had been subjected to considerable modifications and degradation over the years due to urbanization. The goal of the project is to rehabilitate the lake through improvement of lake water quality and fisheries habitat. Project features have included the following: 1. Measurement of lake water levels and development of a lake water budget, 2. Investigation of lake water quality characteristics and management options for improving water quality, 3. Preparation of a bathymetric map, 4. Investigation of the feasibility of reestablishing inflows from watershed areas previously diverted away from the lake, 5. Preparation of a management plan for the lake.

North Fork Feather River, California. Prepared the hydrology and water quality sections of an EIS for a project involving dredging of two reservoirs. The analysis included development of monitoring programs, statistical analysis of the likelihood of hot spots of PCB's or heavy metals in the

sediments and assessment of the effects of the project on suspended sediment loads, beneficial uses of the river, flood conditions, and fisheries.

Groundwater and Hazardous Waste Projects

Conducted a fingerprinting analysis of boron contamination leaching from an ash landfill to determine if nearby residential wells had become contaminated. The ash landfill was located along the north shore of Lake Superior in a region where relatively high levels of boron natural occur in groundwater. A fingerprinting analysis in conjunction with isotope measurements were used to show that nearby residential wells water were not contaminated. An electrical resistivity survey was used to determine aquifer conditions and assist in the identification of the boundaries of the boron plume.

Project manager for technical oversight reviews of the characterization and remediation of three Navy Superfund sites (25 operable units) located in Kitsap County, Washington. Retained by a community public interest group to review work completed by the Navy and Navy contractors, to evaluate the technical adequacy of the work and to keep the community informed of risks associated with the Superfund sites. Contaminates at the sites include ordinance compounds, heavy metals, volatile and semi-volatile organic compounds and petroleum hydrocarbons. Remedial measures included soil washing, groundwater extraction, composting, excavation and landfilling and sediment hot spot removal.

Designed a system of recovery and injection wells for an aquifer remediation program at the location of a wood preservative treatment site near Casswood, Illinois. The sandy outwash aquifer at the site was contaminated by oil ontaining pentachlorophenol.

James J. Thornton — Environmental Scientist

Education

Bachelor of Arts
History and Geography - Land Use
University of Wisconsin
Eau Claire (1991)

Professional Registration/ Certification

State of Wisconsin
Certified Site Assessor

State of Wisconsin
Department of Transportation
Certified Highway Technician
AGGTEC 2

OSHA 40-Hour Hazardous Materials Training

Confined Space Entry Training

Professional Organizations

Federation of Environmental Technologists

General Background

Scientist experienced with landfill construction, operations and maintenance, environmental assessments, site investigations, remedial actions, surveying, subsurface soil, groundwater and sediment investigations, land-use planning, geographic information systems and geotechnical laboratory analyses.

Experience

Landfill Construction Operations and Maintenance projects. Responsible for coordination and execution of quarterly landfill gas and groundwater sampling at over 20 sites throughout central and northern Wisconsin. Responsible for laboratory data analysis and submittal to State regulatory agencies. Strong working knowledge of NR 100, 500 and 700 series. Construction oversight has include groundwater and landfill gas monitoring and extraction well installation, site survey, and construction staking, cap construction and repair oversight and subsurface density testing.

Landfill Construction Operations and Maintenance

Lemler Landfill – Rice Lake, Wisconsin. Subsurface investigation and sampling at a closed solid and demolition waste landfill to assist in the design and implementation of a landfill gas mitigation system.

Hayward Landfill – Hayward, Wisconsin. Led soil and groundwater sampling field activities at a closed solid and demolition waste landfill in order to assess groundwater contamination and landfill gas migration.

Junker Sanitary Landfill – Hudson, Wisconsin. Performed groundwater monitoring, landfill gas sampling and operations and maintenance on an active gas extraction system. Assisted in retrofitting existing landfill gas extraction wells to optimize remediation system performance.

Moccasin Mike Landfill – Superior, Wisconsin. Soil, water and landfill gas sampling, construction staking and site survey for an active municipal solid waste landfill. Data collection and analysis for site scoping during landfill expansion activities.

Environmental Site Assessments

Altoona Landfill – Altoona, Wisconsin. Construction oversight during passive landfill gas mitigation trench installation. Landfill cap construction staking. Soil vapor extraction pilot testing.

Environmental Site Assessments. Responsible for State and Federal regulatory database reviews, site reconnaissance, historical data acquisition and review, personal interviews and report preparation for numerous industrial, commercial, highway, residential and agricultural properties. Responsibilities also have included expanded site assessments including soil, groundwater and construction materials sampling designed to determine the

degree and extent of recognized environmental concerns discovered during initial site assessments.

All Ways Transit, Inc. – Bloomer, Wisconsin. Conducted a Phase I and Phase II Environmental Site Assessment (ESA) at a privately owned manufacturing facility with a history of metal fabrication, welding and electroplating activities. Directed Phase II field sampling to determine degree and extent of metals contamination in site soils.

Markquart Motors, Inc. – Chippewa Falls, Wisconsin. Performed a Phase I and Phase II ESA at an automobile dealership. Subsequent Phase II soil and groundwater sampling was required to determine the degree and extent of a hydraulic oil release discovered during the Phase I.

US 10 – Stevens Points, Wisconsin. Conducted Phase I ESA on a 2-mile highway corridor through commercial, industrial and residential properties to determine the potential for subsurface contamination to impact upcoming street and utility improvements. Directed Phase II sampling at several sites of potential concern discovered during the initial ESA.

Remedial Investigations projects. Investigative work at seventeen petroleum contaminated sites. Responsibilities included subcontractor and state regulatory agency coordination, construction oversight, soil and groundwater sampling, groundwater well and soil vapor extraction well installation, laboratory data compilation and analysis and report preparation.

Mary's Country Villa – Town of Tilden, Wisconsin. Directed remedial investigation at a former gas station with petroleum contaminated soil and groundwater. Based on information collected and analyzed as part of the remedial investigation remedial alternatives were developed and the site is under continuing remediation using soil vapor extraction technologies.

Baker Oil – Hawkins, Wisconsin. Performed remedial investigation at an active bulk petroleum storage facility. Investigation discovered extensive soil contamination and free product contamination of local groundwater.

Sediment Investigations Projects. Conducted subsurface sediment investigations including initial site surveys, including bathymetric surveying, directed field sampling activities, laboratory data correlation and analysis and geotechnical laboratory analysis of sediments.

WDNR ERF, Ashland, Waterfront – Ashland, Wisconsin. Responsible for subsurface investigation activities in sediments and wood wastes within approximately 10 acres of manufactured gas plant and wood treating waste contamination. Offshore data collection activities included the use of dredges, geoprobes and hollow stem auger equipped drilling rigs to define the degree and extent of subsurface contamination.

Smith Park – Bloomington, Minnesota. Directed field sampling and bathymetric survey at a municipal park site to determine the degree and extent of metals contamination in subsurface sediments.

Hydrogeologic Investigations. Soil borings, groundwater monitoring well, piezometer, vapor extraction well, air sparge well, leachate headwell, gas probe and stone column installation and documentation, field report preparation, sampling and well abandonment at over 40 sites throughout central and northern Wisconsin.

Soil Vapor Extraction/Air Sparge Pilot Testing and Monitoring. Pilot testing for design purposes at eight petroleum contaminated sites and two closed municipal landfills utilizing both soil vapor extraction and/or air sparge technologies. Post-design system installation, monitoring, and remedial system optimization.

Kevin E. Accola, CHMM — Environmental Scientist

Education

Bachelor of Science
Environmental and Public Health, University of Wisconsin Eau Claire (1992)

Professional Registration/ Certification

Accredited Asbestos Inspector
Wisconsin, Minnesota, Indiana

Accredited Asbestos Management Planner
Wisconsin, Minnesota

Accredited Asbestos Supervisor
Wisconsin, Minnesota

OSHA 40-Hour HAZWOPER Training Including Annual Refreshers

Troxler Nuclear Safety, Certified

Professional Associations

Federation of Environmental Technologists

Academy of Certified Hazardous Materials Managers (ACHMM)

General Background

Environmental Scientist with technical experience in a variety of environmental projects, where he has served as the lead professional and/or project manager. Typical projects completed include Phase I and II Environmental Site Assessments, asbestos inspections and management plans, and petroleum Site Investigations. Received training for various Brownfield grant programs available from state and federal sources and currently manages several Brownfield projects. Completed Storm Water Pollution Prevention Plans for industrial facilities regulated in accordance with WPDES and NPDES general permits. Certified in the State of Wisconsin to conduct the site assessment portion of underground storage tank removal projects.

Health and safety administrator with responsibility for interpreting, organizing, coordinating and executing the Waste Management Service Area Health and Safety Program. This includes developing site specific health and safety plans, selecting appropriate personal protective equipment, and conducting ambient air monitoring to evaluate employee exposures. Holds the position of corporate radiation safety officer which includes administration of the radiation protection program and employee exposure evaluation.

Experience

Phase I and II Environmental Site Assessments

Project Manager/Project Scientist for the performance and preparation of over 50 Phase I and II Environmental Site Assessments (ESAs) of both small and large commercial and industrial facilities. The Phase I ESAs have been conducted in conformance with American Society for Testing and Materials (ASTM) standards and/or standards imposed by the client or lending institution.

Project tasks for Phase I ESAs included reviewing available historical documents and reports, recording onsite observations of site conditions and operations to identify recognized environmental conditions, reviewing state and federal lists pertaining to the site and surrounding area, reviewing hazardous material use and waste disposal practices, and preparing technical reports. In addition, some Phase I ESAs included an overview of general compliance issues pertaining to hazardous waste generation, handling, and disposal; manifests; air permits; UST's; and recorded violations. Project tasks for Phase II ESAs included identifying field sampling locations and analytical parameters, performing field sampling activities, interpreting analytical data, evaluating remedial options and preparing technical reports.

Some typical projects are included below:

Rawn Property – Shell Lake, Wisconsin. Conducted Phase I and Phase II ESA activities at a former hazardous waste generating facility. Collected soil samples from test pits and hand auger borings in areas where recognized environmental conditions were identified during the Phase I ESA. Also directed Geoprobe boring activities as part of the Phase II ESA.

Welcome Dairy – Colby, Wisconsin. Conducted Phase I ESA activities at two separate facilities. One facility was operating as a cheese manufacturing plant and the other was an abandoned dairy. Conducted site surveys and gathered historical and regulatory information at each location to identify recognized environmental conditions.

Former Sullivan Implement – River Falls, Wisconsin. Conducted Phase I ESA activities at a former farm implement dealership. The Phase I ESA lead to a soil and groundwater investigation that was completed as part of a Phase II ESA. The Phase II ESA included Geoprobe boring activities, an asbestos inspection, and HSA monitoring well installation and sampling. A remedial excavation was completed which lead to no further action at the site.

Aluminum Processing, Inc. – Ladysmith, Wisconsin. Conducted Phase I and Phase II ESA activities at a former aluminum smeltor. Phase II ESA sampling identified hazardous wastes at the facility. Remediation was initiated at the former aluminum smelting facility. The remediation included removal and disposal of hazardous wastes and petroleum contaminated soils. Assisted the City of Ladysmith in obtaining a Brownfield Grant to reimburse some of the project costs.

Champion Auto – New Hope, Minnesota. Completed an integrated Phase I/II ESA at a former auto parts supplier located in a heavy industrial district. Phase II activities included collecting soil and groundwater samples from Geoprobe borings. Also collected soil samples from soil probes to define the extent of contamination in an area below the concrete warehouse floor.

TriCo Solutions, Inc. – Eau Claire, Wisconsin. Completed Phase I ESA activities at this chemical manufacturing facility. Conducted an environmental compliance review of the operations at the facility. This included a review of hazardous waste storage, classification and disposal practices. Also reviewed the applicability of various plans and permits for the facility including storm water permits, air permit, SPCC plan, and WPDES permit.

TriCo Solutions, Inc. – Salt Lake City, Utah. Conducted a Phase I ESA at this multitenant manufacturing facility and warehouse. Completed an environmental compliance review of the operations at the facility. This included a review of hazardous waste storage, classification and disposal practices. Also reviewed the applicability of various plans and permits for the facility including storm water permits, air permit, SPCC plan, and WPDES permit.

Christopher Haller — Senior Technician

Education

Bachelor of Science
Environmental Science
Mount Senario College (1991)

Professional Registration/ Certification

OSHA 40-Hour Hazardous Waste Operations Course

WI UST Site Assessment (1994)

OSHA 40-Hour Hazardous Waste, Certified

General Background

Senior technician with experience in preparation and review of plans and specifications, construction observation for a variety of soil venting, air sparging and groundwater recovery systems. Also experienced in remedial excavations, site remediation design, site study and remedial alternative testing. Construction oversight for municipal wastewater treatment facility including installation of structural concrete, forcemain piping, architectural structures including treatment and site equipment. Responsible for development of operation and maintenance procedures, training of entry level technical staff in field testing, system monitoring and maintenance.

Experience

Altoona Landfill Passive Gas Extraction Site – Altoona, Wisconsin. Installation of landfill lateral extraction trench and piping. Monitoring methane migration and study for effects of the passive extraction trench system. Study and test active methane gas extraction by performing a series of vacuum pilot tests on gas extraction well within the landfill.

Northwestern Wisconsin Electric Company – Frederic, Wisconsin. Site study, including work plan and implementation of work plan for air sparge pilot test and soil vapor extraction pilot test. Design of remediation system and site supervision for installation.

West Bend Landfill, Active Gas Extraction – West Bend, Wisconsin. Responsible for operation, maintenance, and troubleshooting, of LPG fueled ground flair. Troubleshoot, monitor, and maintain electrical controls of system.

Mobil Oil Corporation – Upper Midwestern Region, MI, WI, IL, IN, OH. Remediation systems design review, installation, construction observation, operation, monitoring and supervision of technical staff for over 40 remediation sites, including air sparging, soil vapor extraction and groundwater recovery systems.

Wayne Recycling and Reclamation EPA Super Fund, Remediation Site – Columbia City, Indiana. Site study, remedial alternatives testing, and remedial design. Plans and specifications for combination groundwater recovery, air sparge, injection and soil vapor extraction. Work plans for removing and cleaning of multiple aboveground storage tanks.

ARCO Pipeline – Indiana, Ohio. Site study, remedial alternatives testing, and site remediation of a petroleum contamination site.

Rockwell International – Detroit, Michigan. Coordinate remedial excavation and onsite contract administration and site supervision of a petroleum contamination site.

Wisconsin Central Railroad Co. – Eastern Wisconsin. Site supervisor on a multi-site petroleum underground storage tank removal project. Include Phase I site work and reporting of Phase I results.

Complete Auto Transit, Inc. – Janesville, Wisconsin. Field instrumentation of design changes to remediation system including start-up and trouble shooting of system construction for petroleum reduction. Supervision of operation and maintenance staff for remediation system.

Knapp Wastewater Treatment Plant Installation – Knapp, Wisconsin. RPR construction oversight for installation of sand media filtration treatment plant all related structural, piping and equipment installation.

Ashland Waterfront Cleanup – Ashland, Wisconsin. Onsite monitoring of contamination and laboratory analysis of contaminate sediment for the sediment treatability study.

Rich Hager — GIS/CADD Technician

Education

Bachelor of Science
Geography Resource Management
GIS Emphasis

University of Wisconsin
Eau Claire (2000)

General Background

GIS specialist with project experience including field data collection with GPS, soil sampling and remote sensing. Areas of experience include management of spatial and attribute data using Arcview. GIS data conversion and manipulation. Thematic map interpretation and production. Bathymetric mapping using GPS and depth sounder. Soil sampling, profile description, and particle size analysis. In addition, good communication skills with clients, public experience with government agencies, and overall knowledge of the biotic community

Experience

Danbury Sanitation District – Danbury, Wisconsin. Responsible for creating project boundary limits, coverages and a base map for the entire project using GIS and orthophotos. Management of spatial and attribute data in Arcview. Existing CAD utility drawing were also utilized for the completion of this project.

Bloomer Street Department – Bloomer, Wisconsin. Responsible for replicating cross sections and initial excavation area for a redemption site in Bloomer, Wisconsin utilizing AutoCAD.

City of Chippewa Falls – Chippewa Falls, Wisconsin. Responsible for managing spatial and attribute data for multiple themes in Arcview GIS. Created coverage map using USGS DOOQ for water resources team. Edited and manipulated themes to suit the scope of the project.

Prior to joining SEH

Wisconsin Department of Natural Resources – GIS Specialist

Responsible for creating various watershed maps in Arcview GIS 3.2 used for comprehensive reports for the fisheries management team in the Lower Chippewa Basin. Organized and trained personnel in Arcview GIS software. Assisted in field data collection including GPS. Worked with fisheries management specialists on such duties as electrofishing, tagging and monitoring several species of fish.

Other projects include working on the Lower Chippewa State Natural Area. Utilized orthophotos and DOQ interpretation to locate, identify and digitize potential prairie and savanna restoration sites in the study area using Arcview GIS 3.2.

City of Eau Claire (Regional Zoning and Planning) – Eau Claire's Northside Hill Neighborhood.

Completed a GIS analysis project on the study area. Utilized parcel identifier numbers, census block group data, and existing CAD files to complete the project in Arcview GIS 3.2. Final map was presented to the Steering Committee for the Northside Hill Neighborhood.

Schofield, Lost Highway Site – Eau Claire Wisconsin. A case study in soils and landuse. Determined soil classification and land use of the study area. Project included numerous trips to the study area as well as a webpage.

Bathymetric Mapping of the Eau Claire River – Eau Claire, Wisconsin. Utilized GPS technology with the Trimble GPS-XR, a depth sounder and Arcview GIS 3.2 to create a detailed bathymetric map of the Eau Claire River. Project included several trips down the river with GPS, depth sounder, and a pentop computer loaded with Arcview GIS for "on the fly mapping".

Bear Management in Yosemite National Park – A Resource Management Approach. Researched and analyzed the current bear management problems in the park using GIS and GPS. Project included a field trip to Yosemite, webpage, research paper and poster which was presented to UW Eau Claire Student Research Day in 1999.

Creation of a Fresh Water Catch Basin – St. Vincent Island. Determined suitable site for a fresh water catch basin using various GIS techniques. This extensive GIS project included several themes, overlays and numerous attribute data. It was necessary to look at the whole biotic community when deciding on a site for a fresh water catch basin.

APPENDIX C

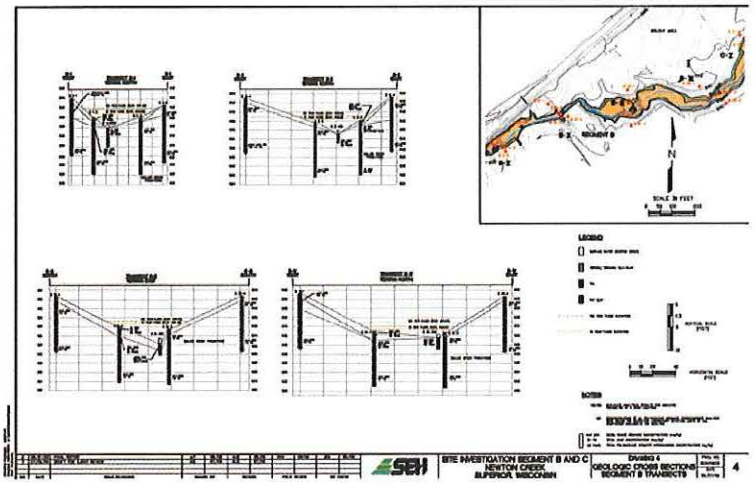
PROJECT DATA SHEETS

Newton Creek Segments B & C Site Investigation

Superior, WI

SEH completed an investigation of Segments B & C of Newton Creek in Superior, WI for the WDNR. Newton Creek begins at a surface water impoundment fed by an oil refinery wastewater treatment plant and extends 1.5 miles to Lake Superior. Segments B & C represented a 2500 ft length of Newton creek, beginning approximately 700 ft downstream from its headwaters. The creek is also intermittently fed by storm water runoff through several storm water discharge points and via overland flow.

The investigation led to further understanding of creek hydraulic characteristics; creek bed and floodplain soils stratigraphy; degree and extent of contamination in the sediments and soils; surface water and groundwater quality; contaminant sources, loading, and transport; human health and ecological risks; potential risk-based cleanup goals; and potential remedial actions.



SEH's specific tasks included:

- Preparing a hydraulic model of Newton Creek from Segment B to Lake Superior
- Completing a supplementary topographic survey of Newton Creek
- Collecting three rounds of surface water column sampling
- Sediment trap installation and two rounds of sampling
- Surficial sediment sampling
- Design, installation, and operation of automated surface water monitors
- Sediment core sampling in creek bottom at eight locations
- Soil sampling from 32 locations along eight transects of the creek and floodplain
- Installing temporary wells and collecting groundwater samples from eight locations
- Preparing and analyzing Human Health and Ecological Risk Assessments
- Preparing a capstone report documenting project findings and conclusions including and evaluation of:
    - -contaminant distribution
    - -expanded hydrocarbon chemistry
    - -contaminant loading and transport
    - -human health risks
    - -ecological risks
    - -cleanup goals
    - -remedial action considerations

Lakefront and Offshore Sediment Investigation and Environmental Study

Ashland, Wisconsin

Client
- Wisconsin Department of Natural Resources

Features
- Former Manufactured Gas Plant (MGP) located upgradient from site
- Over 1,500-feet of Lake Superior shoreline frontage
- Ten acres of manmade lakefront property
- Existing city park and marina

SEH Services
- Historical review of vicinity
- Subsurface investigation of city park and upgradient former MGP site
- Winter investigation of offshore sediments using hydraulic probe sampling techniques
- Identification of VOC, PAH and metals contamination in two aquifers as well as in ten acres of offshore sediments
- Preparation of an ecological risk assessment and human health risk assessment
- Preliminary studies to assess feasibility of natural bioremediation
- Preparation of a feasibility study assessing potential remedial action options for the site
- Ongoing assistance with remediation planning and community presentations
- Bench scale sediment settling/contaminant dispersion column test

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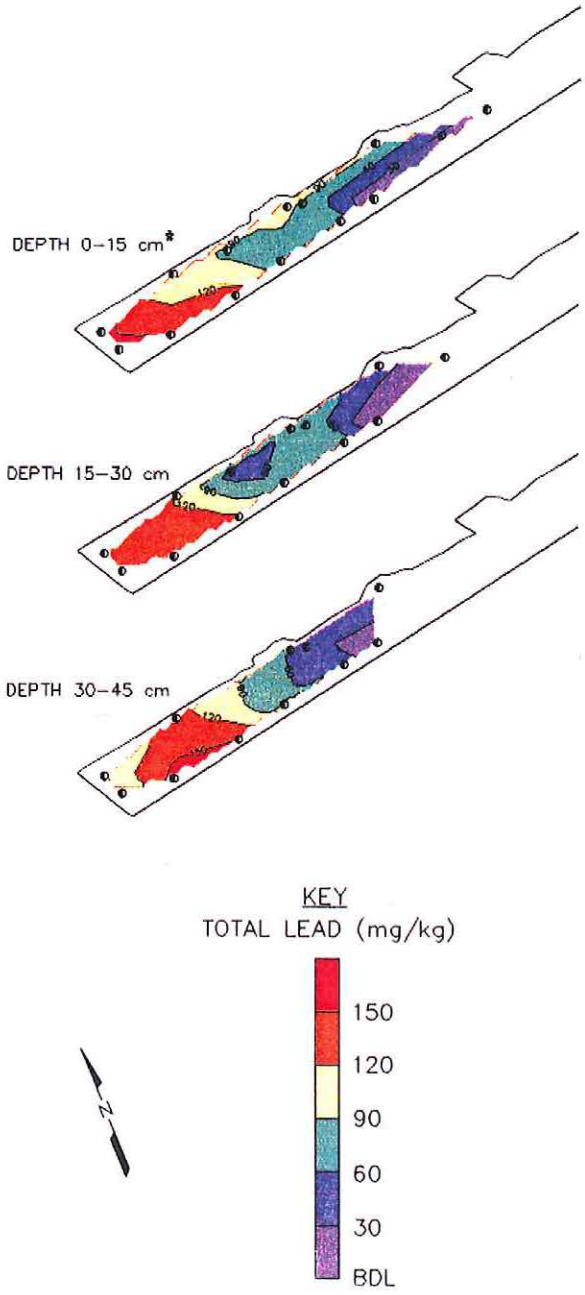
Duluth Harbor Slip C
Sediment Contamination Isoconcentration Mapping

Duluth, Minnesota



Client

- Minnesota Pollution Control Agency

Features

- The mapping project included development of color isoconcentration maps for five chemical parameters at three different sediment depth intervals
- Isoconcentrations were developed using Golden Software Surfer software and final figures were prepared using AutoCAD
- The separate depth intervals for each parameter were integrated to provide a three dimensional interpretation of contaminant concentrations in the slip sediments

SEH Environmental

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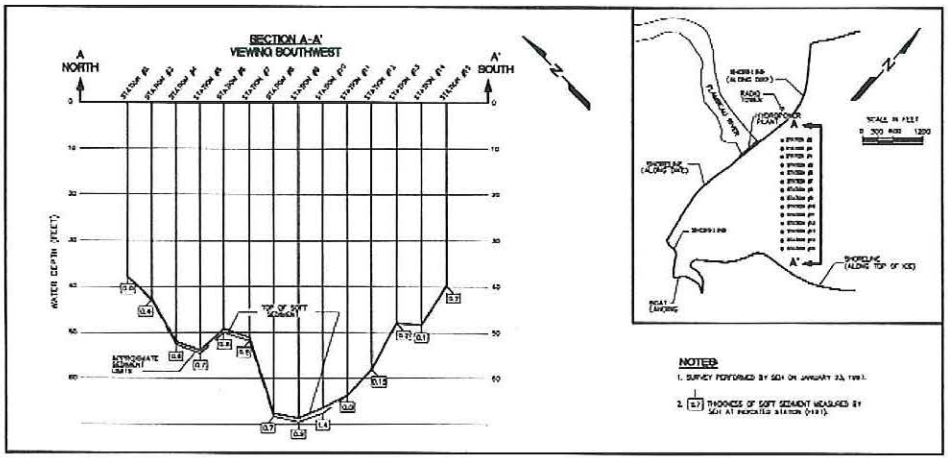
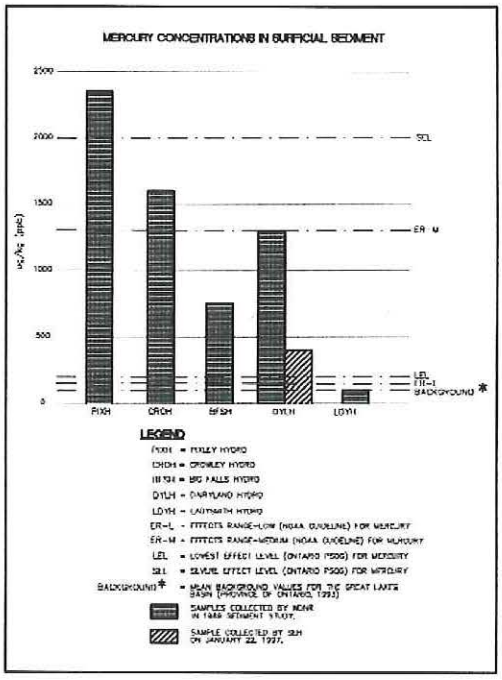
DAIRYLAND POWER SEDIMENT INVESTIGATION

LADYSMITH, WISCONSIN



SEH was retained by the Dairyland Power Cooperative to investigate the level of mercury and heavy metal contamination in the sediments of the Dairyland Reservoir. As part of the FERC hydropower relicensing process, Dairyland Power had been requested to complete a detailed sediment investigation of the Dairyland Reservoir, an impoundment on the Flambeau River, including the following activities: sampling of sediments, chemical analysis of mercury and heavy metals, determination of physical properties of the sediments, measurement of the quantity of accumulated sediments in the reservoir and measurement of sedimentation rates. SEH provided advice and a work plan to Dairyland Power that was used to obtain a reasonable level of study for the conditions at the Dairyland Reservoir.



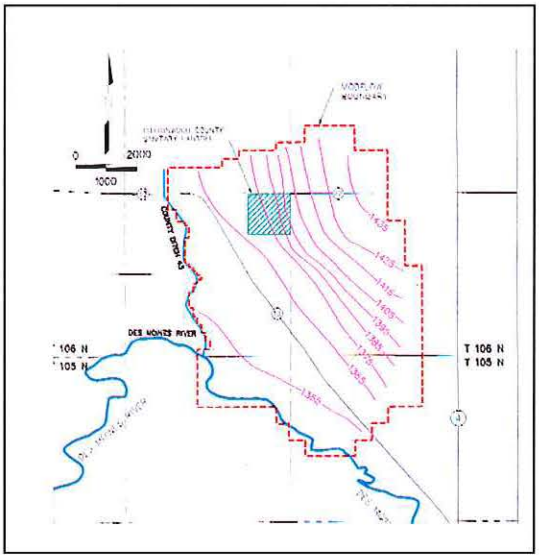
SEH implemented the work plan by sampling sediments in the Dairyland Reservoir through lake ice in depths up to 70 feet. Super clean sampling techniques were used by SEH during sample collection to prevent cross contamination with mercury by the sampler or sampling equipment during sampling activities. Sediment samples were collected for analysis of mercury, a variety of heavy metals, oil and grease and various physical properties of the sediments. Sediment samples were submitted to a super clean laboratory for the analysis of mercury.

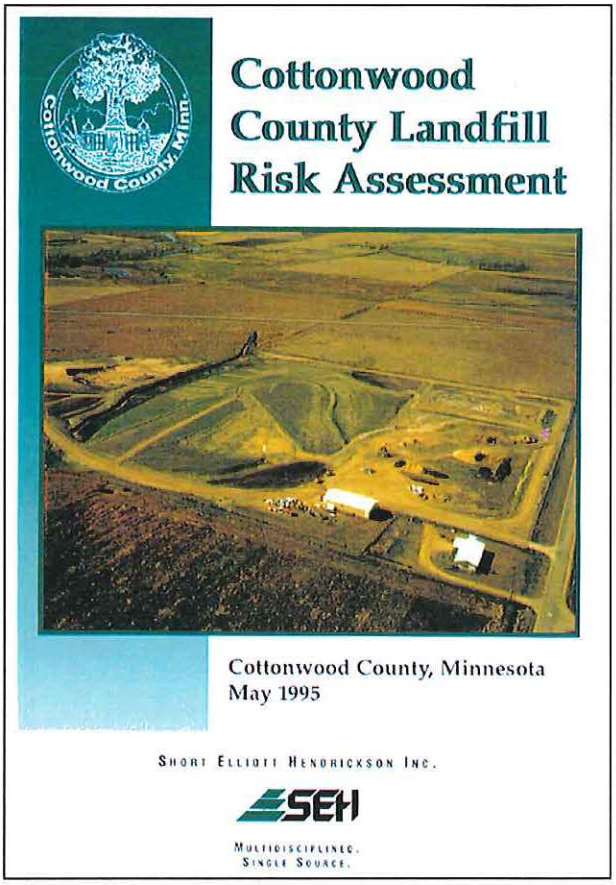
SEH prepared a detailed report on the results of the sediment investigation. One section of the report presented the sampling results for mercury and the heavy metals, comparing the new results to a previous study and to relevant regulatory requirements. A recommendation was made that concentrations of mercury and heavy metals in the Dairyland Reservoir did not warrant further study via the FERC relicensing process. Measurements of accumulated sediments were also presented in the report, and relatively low accumulation rates were observed. As a result of the efforts of SEH, Dairyland Power was able to justify the discontinuance of sediment investigations in the Dairyland Reservoir, saving the cooperative considerable money.

SEH Environmental

Cottonwood County Landfill Contingency Action/Risk Assessment

Windom, Minnesota





During routine quarterly groundwater sampling, arsenic and vinyl chloride was detected in two downgradient wells at the Cottonwood County Landfill at levels above Minnesota Intervention Limits. Confirmation of the results during subsequent sampling initiated contingency response action as required by the County's solid waste landfill permit. SEH was retained to investigate and identify the proper remedial response actions required. SEH developed and implemented a work plan to determine the extent of the problem and risks associated with groundwater quality impacts downgradient of the facility. The project was completed under a short timeline.

MODFLOW, a thee-dimensional finite element groundwater flow model was used to estimate future groundwater trends based on the current groundwater data. MT3D, a fate contaminate transport model, was used to identify future groundwater quality impacts. Both models were integral in assessing impacts to off-site receptors and a quantification of risk to human health and the environment. A risk assessment was completed identifying potential receptors to evaluate the need and the timeline for remedial actions. The results of the assessment determined a low level risk to the area and recommended a revised water quality monitoring plan. Additionally, monitoring wells were installed to better define groundwater quality and track potential migration of contaminates downgradient of the landfill property.

Project Features

- Review of geologic and hydrogeologic investigation
- Groundwater receptor survey
- Local demographics survey (wildlife, land use, endangered species, etc.)
- Groundwater contaminant transport analysis using MODFLOW and MT3D software model

SEH Environmental

Water Resources Engineering and GIS Services

Installing water quality samplers on Kinnickinnic River

Kinnickinnic River Comprehensive Water Quality Plan

River Falls, Wisconsin

Features

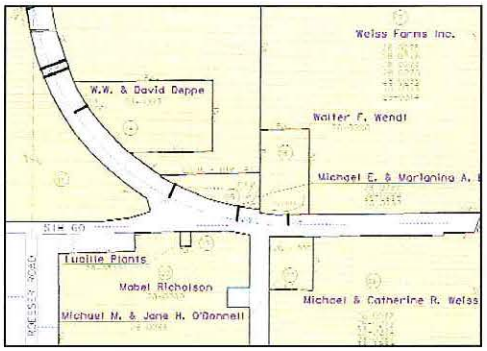
- 64 square mile urban/urbanizing watershed
- GIS (Arc/INFO) generated water quality and hydrologic model input parameters
- Complete land use and wetland inventory
- P8 water quality modeling
- Storm water quality and river (thermal) monitoring
- Hydraulic analysis of watersheds and existing storm drainage systems through the developed City

Highway Access Control

Wisconsin Department of Transportation

Features

- Four 10-mile segments of trunk highway in Iowa, Rock, and Sauk Counties
- First of it's kind project with Geographic Information Systems (GIS) technology and deliverables
- Utilized Global Positioning System (GPS) to map access points
- Data base linkage to Microsoft Access to ArcView® GIS by ESRI®



Example of access control GIS deliverable

Wetland resources near Minong, Wisconsin

US 53 Hydrogeologic and Wetland Evaluation

Wisconsin Department of Natural Resources

Features

- Aerial photo interpretation
- Multiple wetland complex field evaluation
- 50-year vegetative change analysis
- Impact analysis of roadway construction on wetlands and plant communities
- Literature review of road construction effects on wetlands

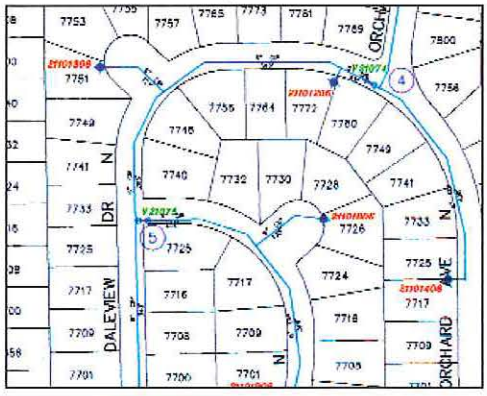
Sanitary Sewer and Water System Data Conversion

Brooklyn Park, Minnesota

Features

- GIS data base for 4,423 manholes along 211 miles of sanitary sewer
- Data base included adjacencies to parcels, size and type of pipe, TV inspection length, year televised and TV tape number, as-built record number
- Graphics delivered in AutoCAD and ArcView®
- Developed as pilot are to verify cost and methodology of data conversion

Infrastructure mapping in Brooklyn Park



SEH Environmental

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Point/Non-Point Source Modeling/Monitoring/Diagnostic Studies

SEH provides monitoring and modeling services for urban and rural watersheds to predict nutrient loadings related to storm water runoff. Monitoring helps to reveal biological productivity and provide information for proposed lake restoration work. Strategies include best management practices to control nutrients in the contributing watershed (sediment basins, street sweeping, and wetland treatment) as well as physical, chemical, and biological measures. These may include aeration and circulation, dredging, dilution, flushing, chemical treatment for algal blooms, chemical nutrient control (such as alum treatment), plant control (herbicides), and biomanipulation.

Services

- Sampler Installation and Maintenance
- Precipitation Monitoring
- Sample Collection and Breakdown
- Independent Laboratory Coordination
- Diagnostic Analysis

Projects

- 69th Avenue Realignment Wetland Mitigation Site
  Brooklyn Center, Minnesota
- Water Management Plan Kinnickinnic River
  River Falls, Wisconsin
- County Road B Storm Sewer and Water Quality Pond Design
  Maplewood, Minnesota
- Snail Lake Level Augmentation and MINLAKE (nutrient response) Modeling
  Shoreview, Minnesota
- Storm Water Quality Monitoring and Lake Management Plans
  Grass Lake WMO
- Mississippi River Outlet (Storm Water) Monitoring
  Six Cities WMO
- Waste Load Allocation Studies
  Tomah and Durand, Wisconsin
- Wood Park Pond Alum Treatment
  Burnsville, Minnesota
- Lake Atlas and Parking System
  Plymouth, Minnesota

SEH Environmental

Contaminated Groundwater Plume Study
New Richmond Landfill
New Richmond, Wisconsin

In 1999, chlorinated volatile organic compounds (VOCs) were detected in drinking water of several private residential wells located within one mile of a closed municipal solid waste landfill. Groundwater samples collected from ten residences contained VOCs at concentrations exceeding State of Wisconsin ch. NR 140 Public Health Groundwater Quality Standard Enforcement Standards (ESs).

SEH was retained to further evaluate impacts to down gradient private wells, perform an alternative water supply study, and assess the degree and extent of VOC-impacted groundwater possibly associated with the closed landfill. SEH evaluated alternative water supply options and recommended that point-of-entry (POE) granular activated carbon (GAC) filtration systems be installed in the water supplies of those residences having constituents in groundwater at concentrations exceeding ESs. SEH negotiated with the Wisconsin Department of Natural Resources and the Wisconsin Department of Commerce to permit the installation of the GAC systems, oversaw system installation and startup, and is performing system operation and maintenance.

On going or future activities for the site include the following:

- Performing maintenance and monitoring of the installed GAC systems;
- Monitoring twenty five other nearby private resident water wells on a quarterly basis;
- Performing a residential water supply system evaluation;
- Performing site investigation activities;
- Evaluating grant and low- or no-interest loan funding opportunities;
- Conducting a public information/participation program; and
- Performing a remedial option feasibility study and remediation, if warranted (future).

SEH Engineering

US 53 Hydrogeologic and Wetland Evaluation

Minong, Wisconsin

Owner

- Wisconsin Department of Transportation

Features

- Applied hydrogeologic and wetland research to determine effects of road construction on wetlands
- Intermediate on-site determination method
- Analyzed two wetland complexes with four transects each
- Analyzed vegetative community changes over a 50-year period
- Made recommendations for proposed project

Design Fee

- $120,000

SEH Services

- Aerial photo interpretation
- Baseline wetland data collection
- Baseline hydrogeologic data collection
- Literature review of road construction effects on wetlands
- Recommendation to mitigate proposed impacts to wetlands

St. Paul, MN
Minneapolis, MN
St. Cloud, MN
Chippewa Falls, WI
Madison, WI

SEH Environmental

Multidisciplined. Single Source.

Ecological Restoration

Representative Projects

- **New Richmond, Wisconsin** Bioengineered bank stabilization plans, specifications, and site observation. Plan calls for two-tiered native grasses planting scheme to meet fluctuating riverine hydrologic conditions.

- **River Falls, Wisconsin** Wooded storm water infiltration ponds plans and specifications. Ecological approach used soil, slope, and moisture conditions to call out woody, herbaceous annual, and perennial species that will colonize fluctuating flow-through hydrologic conditions.

- **Cable Natural History Museum - Cable, Wisconsin** Restoration of terrestrial landscape using a plant ecology approach. Start with soil restoration to support transplanting of native woodland community herb layer species. Management and interpretative educational concepts also developed.

- **Anoka County-Blaine Airport - Blaine, Minnesota** Wetland restoration plans and specifications using an assembly approach to create scrub-shrub wetland communities in an 18.5-acre area. Imported substrate included sedge seed and rhizome bank with 80-90% establishment success.

- **Wood Park Pond - Burnsville, Minnesota** Lakeshore restoration plans and specifications using coconut fiber rolls and native lakeshore planting scheme.

- **Kraemer Nature Preserve - Burnsville, Minnesota** Construction plan review and observation for reclamation of mining site, including regrading 30 acres for restoration of prairie/marsh community and monitoring revegetation progress. Revegetation strategy using a successional approach.

SEH Services

- Establishing ecological restoration trajectory and goals
- Strategy selection for community-based restoration
- Environmental site evaluations
- Plans and specifications for microhabitat restoration requirements
- Native plant species selection
- Developing contract propagation requirements

SEH Environmental

Biopile Remediation Facility

Black River Falls, Wisconsin

Features

An active bioremediation system was constructed at an existing, operating landfill for the treatment of petroleum contaminated soils. A clay treatment pad, one acre in area, was constructed adjacent to the existing landfill. A storm water collection system consisting of a perimeter trench and a two-stage retention pond was also constructed for contaminant and collection of runoff. The treatment area has the capacity to operate three biopiles of 6,000 tons of soil each simultaneously. When treatment objectives for each biopile are attained, the soil is transferred to the landfill where it is used in the grading layer for the landfill cover system. A treatment building was constructed to house the equipment for vapor extraction and recirculation, liquid injection, and emissions treatment. The treatment system utilizes an air recirculation system mixing extracted vapors and ambient air so soil conditions are conducive to aerobic bioremediation.

SEH Services

SEH conducted a Feasibility Study for Jackson County Sanitary Landfill, Inc. to determine if the facility was technically and economically feasible. Following the study, SEH partnered with the owner and regulatory agencies to expedite the permitting and licensing process. A Plan of Operation was prepared and conditional approval was granted by the WDNR. SEH prepared plans for treatment pad construction and coordinated the activities with the owner while plans and specifications for the treatment equipment were prepared and competitively bid to contractors. SEH conducted construction oversight for the treatment pad, equipment, and controls. SEH continues to provide site and system operation, monitoring, and reporting in coordination with the owner. The facility treats approximately 20,000 tons of contaminated soil per year.

SEH Environmental

APPENDIX D

COST BREAKDOWN

PROJECT NAME: **Newton Creek/Hog Island Inlet Investigation**
PROJECT LOCATION: Superior, Wisconsin
CLIENT: Wisconsin Department of Natural Resources

COST ELEMENT		TASK 1 HISTORICAL REVIEW		TASK 2 WORK PLAN		TASK 3 SITE SURVEYS		TASK 4 GEOLOGIC BORINGS		TASK 5 SEDIMENT SAMPLES		TASK 6 WATER COLUMN SAMPLES		TASK 7 AUTOMATIC WATER SAMPLERS	
	RATE	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT
1. PROFESSIONAL SERVICES															
A. LABOR															
CYRUS INGRAHAM	$135.00	2	$270	2	$270	0	$0	0	$0	0	$0	0	$0	0	$0
MARK BROSES	$100.00	16	$1,600	16	$1,600	8	$800	8	$800	10	$1,000	20	$2,000	30	$3,000
JOHN GUHL	$90.00	0	$0	40	$3,600	0	$0	80	$7,200	80	$7,200	20	$1,800	20	$1,800
GLORIA CHOJNACKI	$90.00	60	$5,400	4	$360	0	$0	0	$0	0	$0	0	$0	0	$0
ROGER CLAY	$100.00	0	$0	4	$400	0	$0	0	$0	0	$0	0	$0	0	$0
CHRIS HALLER	$65.00	0	$0	4	$260	0	$0	20	$1,300	80	$5,200	40	$2,600	440	$28,600
DAVE ETHERIDGE	$45.00	0	$0	0	$0	0	$0	0	$0	40	$1,800	40	$1,800	0	$0
COLIN	$90.00	60	$5,400	0	$0	0	$0	0	$0	0	$0	20	$1,800	0	$0
RICH HAGER	$45.00	40	$1,800	8	$360	120	$5,400	40	$1,800	0	$0	20	$900	0	$0
SURVEYOR	$55.00	0	$0	0	$0	60	$3,300	0	$0	0	$0	0	$0	0	$0
LEANNE SEDANI	$45.00	0	$0	4	$180	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL LABOR HRS./$		178	$14,470	82	$7,030	188	$9,500	148	$11,100	210	$15,200	160	$10,900	490	$33,400
B. SUBCONTRACTORS			$0		$0		$0		$12,000		$0		$0		$95,000
TOTAL PROFESSIONAL SERVICES			$14,470		$7,030		$9,500		$23,100		$15,200		$10,900		$128,400
2. REIMBURSABLE EXPENSES															
A. TRAVEL			$213		$0		$200		$570		$158		$158		$675
B. HEALTH & SAFETY EQUIPMENT			$0		$0		$750		$0		$0		$150		$0
C. FIELD EQUIPMENT			$0		$0		$250		$375		$500		$0		$0
D. OFFICE EXPENSES			$200		$100		$0		$0		$0		$0		$0
TOTAL REIMBURSABLE EXPENSES			$413		$100		$1,200		$945		$658		$308		$675
TOTAL PROJECT (LABOR & EXPENSES)			$14,883		$7,130		$10,700		$24,045		$15,858		$11,208		$129,075

EXPENSE DETAILS

	UNIT	RATE	TASK 1 QUANTITY	COST	TASK 2 QUANTITY	COST	TASK 3 QUANTITY	COST	TASK 4 QUANTITY	COST	TASK 5 QUANTITY	COST	TASK 6 QUANTITY	COST	TASK 7 QUANTITY	COST
1.B SUBCONTRACTORS & SUBCONSULTANTS																
Battelle				$0		$0		$0		$0		$0		$0		$0
En Chem				$0		$0		$0		$0		$0		$0		$0
Matrix				$0		$0		$0		$12,000		$0		$0		$0
LSRI				$0		$0		$0		$0		$0		$0		$0
DRM				$0		$0		$0		$0		$0		$0		$0
Turner				$0		$0		$0		$0		$0		$0		$35,000
KV Controls & Instrumentation				$0		$0		$0		$0		$0		$0		$60,000
Hart Crowser				$0		$0		$0		$0		$0		$0		$0
TOTAL				$0		$0		$0		$12,000		$0		$0		$95,000
2.A TRAVEL EXPENSES																
TRUCK MILEAGE	MILE	0.45	0	$0	0	$0	350	$158	800	$360	350	$158	350	$158	1500	$675
AUTO MILEAGE	MILE	0.32	600	$192	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
MEALS	MEAL	7	3	$21	0	$0	6	$42	30	$210	0	$0	0	$0	0	$0
TOTAL				$213		$0		$200		$570		$158		$158		$675
2.B HEALTH & SAFETY EQUIPMENT																
INSTRUMENTATION	DAY	75	0	$0	0	$0	10	$750	0	$0	0	$0	2	$150	0	$0
PPE	DAY	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$0		$750		$0		$0		$150		$0
2.C FIELD EQUIPMENT																
FIELD EQUIP.	DAY	50	0	$0	0	$0	5	$250	5	$250	2	$100	0	$0	0	$0
SAMPLING EQUIP.	DAY	25	0	$0	0	$0	0	$0	5	$125	2	$50	0	$0	0	$0
TOTAL				$0		$0		$250		$375		$150		$0		$0
2.D OFFICE EXPENSES																
POSTAGE/SHIPPIN	SHIP	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
PHOTO/COPY	UNIT	10	20	$200	10	$100	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$200		$100		$0		$0		$0		$0		$0

PROJECT NAME: **Newton Creek/Hog Isla**
PROJECT LOCATION: Superior, Wisconsin
CLIENT: Wisconsin Department c

COST ELEMENT		TASK 8 MONITORING WELLS		TASK 9 BENCH-SCALE STUDY		TASK 10 ECOLOGICAL-RISK ASSESSMENT		TASK 11 HUMAN HEALTH RISK ASSESSMENT		TASK 12 SEDIMENT QUALITY OBJECTIVES		TASK 13 SED/SOIL ANALYSIS		TASK 14 SURFACE & GW ANALYSIS		TASK 15 FORENSIC ANALYSIS	
	RATE	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT
1. PROFESSIONAL SERVICES																	
A. LABOR																	
CYRUS INGRAHAM	$135.00	0	$0	4	$540	4	$540	4	$540	4	$540	0	$0	0	$0	2	$270
MARK BROSES	$100.00	0	$0	40	$4,000	100	$10,000	10	$1,000	40	$4,000	4	$400	4	$400	10	$1,000
JOHN GUHL	$90.00	32	$2,880	20	$1,800	20	$1,800	20	$1,800	0	$0	10	$900	16	$1,440	10	$900
GLORIA CHOJNACKI	$90.00	0	$0	0	$0	0	$0	200	$18,000	8	$720	0	$0	0	$0	0	$0
ROGER CLAY	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
CHRIS HALLER	$65.00	20	$1,300	80	$5,200	0	$0	0	$0	0	$0	16	$1,040	16	$1,040	0	$0
DAVE ETHERIDGE	$45.00	0	$0	20	$900	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
COLIN	$90.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
RICH HAGER	$45.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
SURVEYOR	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
LEANNE SEDANI	$45.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL LABOR HRS./$		52	$4,180	164	$12,440	124	$12,340	234	$21,340	52	$5,260	30	$2,340	36	$2,880	22	$2,170
B. SUBCONTRACTORS			$3,500		$50,000		$55,440		$5,000		$0		$78,800		$19,000		$23,700
TOTAL PROFESSIONAL SERVICES			$7,680		$62,440		$67,780		$26,340		$5,260		$81,140		$21,880		$25,870
2. REIMBURSABLE EXPENSES																	
A. TRAVEL			$0		$315		$0		$0		$0		$0		$158		$0
B. HEALTH & SAFETY EQUIPMENT			$0		$750		$0		$0		$0		$0		$0		$0
C. FIELD EQUIPMENT			$0		$4,000		$0		$0		$0		$0		$0		$0
D. OFFICE EXPENSES			$0		$0		$0		$0		$0		$150		$150		$0
TOTAL REIMBURSABLE EXPENSES			$0		$5,065		$0		$0		$0		$150		$308		$0
TOTAL PROJECT (LABOR & EXPENSES)			$7,680		$67,505		$67,780		$26,340		$5,260		$81,290		$22,188		$25,870

EXPENSE DETAILS

	UNIT	RATE	TASK 8 QUANTITY	COST	TASK 9 QUANTITY	COST	TASK 10 QUANTITY	COST	TASK 11 QUANTITY	COST	TASK 12 QUANTITY	COST	TASK 13 QUANTITY	COST	TASK 14 QUANTITY	COST	TASK 15 QUANTITY	COST
1.B SUBCONTRACTORS & SUBCONSULTAN																		
Battelle				$0		$50,000		$0		$0		$0		$0		$0		$23,700
En Chem				$0		$0		$0		$0		$0		$78,800		$19,000		$0
Matrix				$3,500		$0		$0		$0		$0		$0		$0		$0
LSRI				$0		$0		$55,440		$0		$0		$0		$0		$0
DRM				$0		$0		$0		$5,000		$0		$0		$0		$0
Turner				$0		$0		$0		$0		$0		$0		$0		$0
KV Controls & Instrumentation				$0		$0		$0		$0		$0		$0		$0		$0
Hart Crowser				$0		$0		$0		$0		$0		$0		$0		$0
TOTAL				$3,500		$50,000		$55,440		$5,000		$0		$78,800		$19,000		$23,700
2.A TRAVEL EXPENSES																		
TRUCK MILEAGE	MILE	0.45	0	$0	700	$315	0	$0	0	$0	0	$0	0	$0	350	$158	0	$0
AUTO MILEAGE	MILE	0.32	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
MEALS	MEAL	7	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$315		$0		$0		$0		$0		$158		$0
2.B HEALTH & SAFETY EQUIPMENT																		
INSTRUMENTATION	DAY	75	0	$0	10	$750	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
PPE	DAY	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$750		$0		$0		$0		$0		$0		$0
2.C FIELD EQUIPMENT																		
FIELD EQUIP.	DAY	50	0	$0	80	$4,000	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
SAMPLING EQUIP.	DAY	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$4,000		$0		$0		$0		$0		$0		$0
2.D OFFICE EXPENSES																		
POSTAGE/SHIPPIN	SHIP	25	0	$0	0	$0	0	$0	0	$0	0	$0	6	$150	6	$150	0	$0
PHOTO/COPY	UNIT	10	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$0		$0		$0		$0		$150		$150		$0

PROJECT NAME: **Newton Creek/Hog Isla**
PROJECT LOCATION: Superior, Wisconsin
CLIENT: Wisconsin Department c

COST ELEMENT		TASK 16 CESIUM DATING		TASK 17 SI REPORT		TASK 18 HHRA REPORT		TASK 19 ERA REPORT		TASK 20 BENCH SCALE REPORT		TASK 21 RAO REPORT		TASK 22 PM & PROGRESS &PUBLIC MEETINGS		PROJECT TOTALS	
	RATE	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT		
1. PROFESSIONAL SERVICES																	
A. LABOR																	
CYRUS INGRAHAM	$135.00	0	$0	4	$540	4	$540	4	$540	4	$540	4	$540	32	$4,320	74	$9,990
MARK BROSES	$100.00	4	$400	24	$2,400	24	$2,400	160	$16,000	40	$4,000	100	$10,000	240	$24,000	908	$90,800
JOHN GUHL	$90.00	0	$0	160	$14,400	0	$0	0	$0	0	$0	0	$0	8	$720	536	$48,240
GLORIA CHOJNACKI	$90.00	0	$0	0	$0	160	$14,400	20	$1,800	0	$0	0	$0	8	$720	460	$41,400
ROGER CLAY	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0	16	$1,600	0	$0	20	$2,000
CHRIS HALLER	$65.00	0	$0	0	$0	0	$0	0	$0	24	$1,560	16	$1,040	0	$0	756	$49,140
DAVE ETHERIDGE	$45.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	100	$4,500
COLIN	$90.00	0	$0	0	$0	20	$1,800	20	$1,800	0	$0	0	$0	0	$0	120	$10,800
RICH HAGER	$45.00	0	$0	100	$4,500	80	$3,600	20	$900	10	$450	40	$1,800	60	$2,700	538	$24,210
SURVEYOR	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	60	$3,300
LEANNE SEDANI	$45.00	0	$0	10	$450	10	$450	10	$450	5	$225	10	$450	20	$900	69	$3,105
TOTAL LABOR HRS./$		4	$400	298	$22,290	298	$23,190	234	$21,490	83	$6,775	186	$15,430	368	$33,360	3641	**$287,485** LABOR
B. SUBCONTRACTORS			$4,000		$1,000		$0		$0		$0		$1,000		$0		**$348,440** SUBS
TOTAL PROFESSIONAL SERVICES			$4,400		$23,290		$23,190		$21,490		$6,775		$16,430		$33,360		**$635,925** LABOR+SUBS
2. REIMBURSABLE EXPENSES																	
A. TRAVEL			$0		$0		$0		$0		$0		$0		$0		
B. HEALTH & SAFETY EQUIPMENT			$0		$0		$0		$0		$0		$0		$0		
C. FIELD EQUIPMENT			$0		$0		$0		$0		$0		$0		$0		
D. OFFICE EXPENSES			$0		$250		$250		$250		$250		$250		$0		
TOTAL REIMBURSABLE EXPENSES			$0		$250		$250		$250		$250		$250		$0		**$11,070** EXPENSES
TOTAL PROJECT (LABOR & EXPENSES)			$4,400		$23,540		$23,440		$21,740		$7,025		$16,680		$33,360	$646,995	**$646,995** TOTAL

EXPENSE DETAILS

	UNIT	RATE	TASK 16 QUANTITY	COST	TASK 17 QUANTITY	COST	TASK 18 QUANTITY	COST	TASK 19 QUANTITY	COST	TASK 20 QUANTITY	COST	TASK 21 QUANTITY	COST	TASK 22 QUANTITY	COST		
1.B SUBCONTRACTORS & SUBCONSULTAN																		
Battelle				$0		$0		$0		$0		$0		$0		$0		$73,700
En Chem				$0		$0		$0		$0		$0		$0		$0		$97,800
Matrix				$0		$0		$0		$0		$0		$0		$0		$15,500
LSRI				$0		$0		$0		$0		$0		$0		$0		$55,440
DRM				$0		$0		$0		$0		$0		$0		$0		$5,000
Turner				$0		$0		$0		$0		$0		$0		$0		$35,000
KV Controls & Instrumentation				$0		$0		$0		$0		$0		$0		$0		$60,000
Hart Crowser				$4,000		$1,000		$0		$0		$0		$1,000		$0		$6,000
TOTAL				$4,000		$1,000		$0		$0		$0		$1,000		$0		$348,440
2.A TRAVEL EXPENSES																		
TRUCK MILEAGE	MILE	0.45	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	4400	$1,980
AUTO MILEAGE	MILE	0.32	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	600	$192
MEALS	MEAL	7	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	39	$273
TOTAL				$0		$0		$0		$0		$0		$0		$0		$2,445
2.B HEALTH & SAFETY EQUIPMENT																		
INSTRUMENTATION	DAY	75	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	22	$1,650
PPE	DAY	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$0		$0		$0		$0		$0		$0		$1,650
2.C FIELD EQUIPMENT																		
FIELD EQUIP.	DAY	50	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	92	$4,600
SAMPLING EQUIP.	DAY	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	7	$175
TOTAL				$0		$0		$0		$0		$0		$0		$0		$4,775
2.D OFFICE EXPENSES																		
POSTAGE/SHIPPIN	SHIP	25	0	$0	4	$100	4	$100	4	$100	4	$100	4	$100	0	$0	32	$800
PHOTO/COPY	UNIT	10	0	$0	15	$150	15	$150	15	$150	15	$150	15	$150	0	$0	105	$1,050
TOTAL				$0		$250		$250		$250		$250		$250		$0		$1,850

OPTIONAL TASKS

COST ELEMENT		OPTION 7A DELETE TELEMETRY		OPTION 10 A CHEM ANALY TOX TESTS		OPTION 10 B ACTIVITY TRAPS		OPTION 11A BG SAMPL FOR HHRA		OPTION 11B SURFACE SAMPLE FOR HHRA		OPTION 13A TOC SOIL SAMPLES		OPTION 13 B FULL SCAN ALL SOILS		OPTION 13C TVOC ALL SOILs		OPTION 14A TOC, TSS, TDS WATER		OPTION 14B TVOCs WATER	
	RATE	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT	HOURS	AMOUNT
1. PROFESSIONAL SERVICES																					
A. LABOR																					
CYRUS INGRAHAM	$135.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
MARK BROSES	$100.00	0	$0	8	$800	24	$2,400	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
JOHN GUHL	$90.00	0	$0	0	$0	0	$0	12	$1,080	30	$2,700	20	$1,800	20	$1,800	0	$0	5	$450	0	$0
GLORIA CHOJNACKI	$90.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
ROGER CLAY	$100.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
CHRIS HALLER	$65.00	-80	-$5,200	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	27	$1,755	0	$0
DAVE ETHERIDGE	$45.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
COLIN	$90.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
RICH HAGER	$45.00	0	$0	0	$0	0	$0	4	$180	8	$360	6	$270	30	$1,350	30	$1,350	20	$900	20	$900
SURVEYOR	$55.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
LEANNE SEDANI	$45.00	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL LABOR HRS./$		-80	-$5,200	8	$800	24	$2,400	16	$1,260	38	$3,060	26	$2,070	50	$3,150	30	$1,350	52	$3,105	20	$900
B. SUBCONTRACTORS			-$35,000		$6,400		$17,622		$4,800		$15,800		$16,500		$47,800		$24,300		$4,620		$1,100
TOTAL PROFESSIONAL SERVICES			-$40,200		$7,200		$20,022		$6,060		$18,860		$18,570		$50,950		$25,650		$7,725		$2,000
2. REIMBURSABLE EXPENSES																					
A. TRAVEL			$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
B. HEALTH & SAFETY EQUIPMENT			$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
C. FIELD EQUIPMENT			$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
D. OFFICE EXPENSES			$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
TOTAL REIMBURSABLE EXPENSES			$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
TOTAL PROJECT (LABOR & EXPENSES)			-$40,200		$7,200		$20,022		$6,060		$18,860		$18,570		$50,950		$25,650		$7,725		$2,000

EXPENSE DETAILS

	UNIT	RATE	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST	QUANTITY	COST
1.B SUBCONTRACTORS & SUBCONSULTANTS																						
Battelle				$0		$4,600		$0		$0		$0		$0		$0		$0		$0		$0
En Chem				$0		$1,800		$0		$4,800		$15,800		$16,500		$47,800		$24,300		$4,620		$1,100
Matrix				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
LSRI				$0		$0		$17,622		$0		$0		$0		$0		$0		$0		$0
DRM				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
Turner				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
KV Controls & Instrumentation				-$35,000		$0		$0		$0		$0		$0		$0		$0		$0		$0
Hart Crowser				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
TOTAL				-$35,000		$6,400		$17,622		$4,800		$15,800		$16,500		$47,800		$24,300		$4,620		$1,100
2.A TRAVEL EXPENSES																						
TRUCK MILEAGE	MILE	0.45	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
AUTO MILEAGE	MILE	0.32	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
MEALS	MEAL	7	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
2.B HEALTH & SAFETY EQUIPMENT																						
INSTRUMENTATION	DAY	75	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
PPE	DAY	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
2.C FIELD EQUIPMENT																						
FIELD EQUIP.	DAY	50	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
SAMPLING EQUIP.	DAY	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0
2.D OFFICE EXPENSES																						
POSTAGE/SHIPPING	SHIP	25	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
PHOTO/COPY	UNIT	10	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0	0	$0
TOTAL				$0		$0		$0		$0		$0		$0		$0		$0		$0		$0

APPENDIX E

QUALITY ASSURANCE PLAN

Appendix E - Draft Quality Assurance Plan
Newton Creek Drainage Basin

Quality assurance is the overall plan for assuring reliability of field and analytical data, as well as assuring the logistical implementation of the work plan. Quality control is the routine application of procedures for obtaining prescribed standards of performance during field activities. Specific documentation and Quality Assurance/Quality Control (QA/QC) procedures will be followed during the investigation activities at the Newton Creek site to ensure that accurate and representative data is collected. This section describes the procedures to be followed during field activities only. The laboratories contracted to conduct laboratory analyses will perform QA/QC in accordance with specific method requirements and laboratory standard operating procedures.

Field Documentation

A written log will be used to document field procedures and conditions. The log will be kept in a bound field book with pre-numbered pages. Field notes will be entered daily when activities occur and include, at minimum, the following information:

- Date
- Personnel
- Weather
- Equipment on site
- Calibrations performed
- Field screening results
- Sampling locations
- Sampling methods
- Decontamination procedures
- Sample identification
- Time/date of sample collection
- Detailed description of soils and sediments
- Field preservation performed
- Field QC data
- Deviations from the work plan or special conditions
- Other significant observations

In addition to the written log, a photographic log will also be prepared to document field conditions, sampling procedures and results. The photographs will be labeled to indicate the subject, date, time, location, direction, and other relevant information. Photographs and written field logs will be stored in the SEH project file.

Public Communications

Questions from the general public regarding site conditions, purpose of investigation, etc., should be directed to the WDNR Project Manager, Jim Hosch at (715) 392-0802. Field personnel will be given a packet of Jim Hosch's business cards to distribute to interested individuals as necessary.

Property Access Agreements

SEH will contact property owners regarding proposed site activities. Copies of access agreements and/or telephone notification records will be provided to the WDNR. Field personnel will attempt to directly notify the owner contacts regarding specific activities and dates prior to arriving at the site.

Equipment Calibration

Prior to the start of field activities, field instruments will be calibrated. Calibration intervals and procedures will be those recommended by the manufacturer, unless experience indicates a shorter interval is required. Calibration activities will be documented in the field book.

Decontamination Procedures

Sampling equipment will be decontaminated prior to use in the field, or will be disposable and dedicated to a single sample. Equipment to be reused in the field at different locations or sampling depths will be stainless steel and decontaminated prior to each reuse. The decontamination method will involve a detergent or trisodium phosphate (TSP) wash and a triple rinse of deionized water.

Field Quality Assurance Samples

Field QA samples will include duplicate samples, trip and temperature blanks. Trip or reagent blanks will be analyzed for VOCs, when VOC analyses are being conducted. Temperature blanks are additional water containers included with the collected site samples and used by the laboratory to determine the temperature of samples on receipt by the laboratory.

Field QA samples will be handled and stored in an identical manner as actual samples. Results of the analysis of the field QA samples will be included with the summary report.

Sampling equipment will utilize dedicated liners, tubing, or bailers for each sample location, therefore field blanks will not be collected. In the event that equipment will be reused at another sampling location or depth, a field blank will be submitted to the laboratory as a check on decontamination procedures.

In general, 10 percent of laboratory samples collected will be duplicate samples. A minimum of one temperature blank will be submitted per shipping container for samples that require cooling for preservation. The temperature blank is not required if the samples are received by the laboratory on ice. The samples will be maintained on ice or at a temperature no greater than 4°C continuously from the time of sample collection until their receipt by the laboratory. If trip or field blanks are collected, a minimum of one per sample matrix per day or one field blank for every 10 samples (whichever is greater) will be collected.

Samples will be collected, properly preserved, and immediately placed on ice for shipment to the analytical laboratory. Holding time ranges for the specified analytical methods will be strictly observed. Samples will be shipped in an insulated cooler packed with ice. Blue plastic ice packs will not be used.

Sample Tracking

Individual labels describing the sample identification, location, sampler's name, date, preservatives, and other relevant information will be attached to the sample container. All samples submitted for analyses will be tracked using strict chain of custody procedures. Sample bottles will be tracked from the laboratory, to the field, through sample collection, and back to the analytical laboratory. The chain of custody will also document relevant sampling and preservation information including collection, shipping and laboratory receipt times.

Laboratory Quality Assurance

Table 1 provides a summary of the various analyses to be performed, preservation methods, container type, standard analytical methods, detection limits, holding times, and the designated laboratory.

SEH will utilize EnChem, Inc., to perform the majority of the chemical analysis. EnChem is certified by the State of Wisconsin to perform the standard analyses proposed. EnChem's WDNR laboratory identification number is 405132750. Battelle will be utilized to perform the specialty hydrocarbon analyses. LSRI will perform the sediment macroinvertebrate taxonomy survey and toxicity tests. SEH will perform the soil grain size analysis.

Each laboratory has provided SEH with a statement of qualifications and a copy of its quality assurance program. These documents are stored in the SEH project file.

Matrix Spike Analysis

Matrix spike analysis provides information about the effect of the sample matrix on digestion and measurement methodology. All matrix spikes should be performed in duplicate. Matrix spike and matrix spike duplicate samples (MS/MSD) samples will be selected in advance by the Field Team Leader in coordination with the laboratory to ensure ample sample volume

MS/MSD pairs will be analyzed at a rate of at least one pair per analytical batch of up to 20 samples. Additional sample volume (approximately two additional sets) will be collected. The MS/MSD samples will be placed in collection containers, labeled appropriately, and identified as such on the chain-of-custody records.

Upon arrival at the laboratory, the MS/MSD samples will be spiked with appropriate analytes and analyzed according to the referenced method. Results from the analysis of MS/MSD samples will be used to evaluate the effect of the matrix on precision and accuracy. The percent recoveries will be calculated for each of the analytes detected and used to assess analytical accuracy. The relative percent difference (RPD) between MS and MSD samples will be calculated and used to assess analytical precision.

For inorganic analyses, a matrix replicate is analyzed instead of an MSD. Unlike an MS/MSD, the replicate is merely a duplicate analysis of a field sample. The precision is based on this duplicate and the original analysis.

Laboratory Analytical Data Storage

Analytical data from the laboratories will be submitted to SEH in both electronic and hardcopy form. Data summary tables will be constructed from the electronic files to minimize potential for manual data transfer errors.

Investigation Derived Wastes.

Investigation derived wastes (IDW) will be collected and stored for disposal. Disposable items will be placed in garbage bags and will be disposed in an appropriate garbage receptacle at the facility. Drilling and Geoprobe cuttings will be placed on and covered with plastic sheeting in a centralized staging area at the facility. Liquids, such as purge water, will be containerized in 55-gallon drums. SEH will collect and analyze representative soil and water samples to determine the appropriate disposal method. It is anticipated that the drill cuttings will be disposed during subsequent field activities conducted at the site and that waste liquids will be disposed in the sanitary sewer also during subsequent field activities. If subsequent remediation or field activities are not conducted, it is assumed that SEH will arrange for proper disposal of the investigation derived waste.

Table 1. Analytical Methods for Chemical Analyses
Second Phase Site Investigation of Newton Creek

SI Component & Parameter	Method	Laboratory	Holding Time	Container Type(1) & Volume/Sample Size	Preservation Requirements(2)	Detection Limits
Sediment and Soil Matrices						
Petroleum VOCs	SW846 8021B	En Chem	21 days	60 ml.widemouth glass/20-35 g.	20 ml. MeOH added in field	various
Polynuclear Aromatic Hydrocarbons (PAH)	SW846 8310	En Chem	14 days	250 ml.widemouth amber glass/250 g.	none	various
Cadmium	SW846 6010B	En Chem	6 months	glass or plastic/100 g.	none	0.046 mg/kg
Chromium, Total	SW846 6010B	En Chem	6 months	glass or plastic/100 g.	none	0.2 mg/kg
Chromium +6	SW8486 7196A	En Chem	30 days	glass or plastic/50 g.	none	0.33 mg/kg
Lead	SW846 6010B	En Chem	6 months	glass or plastic/100 g.	none	0.19 mg/kg
Mercury	SW846 7471A	En Chem	28 days	glass or plastic/25 g.	none	0.0027 mg/kg
SEM/AVS metals	EPA draft Method 1629	En Chem	14 days	4 oz. widemounth glass/100 g.	none	various
Total Organic Carbon (TOC)	SW846 9060M	En Chem	28 days	glass or plastic/30 g.	none	230 mg/kg
PAH, Expanded & Alkyl Substitutes (Battelle)	MOD EPA 415.1	Batelle	7 days	8 oz. glass/250 g.	none	various
Grain Size- Mechanical	ASTM D 422-63	SEH	N/A	varies	none	N/A
Grain Size- Hydrometer	ASTM D 422-63	SEH	N/A	varies	none	N/A
Surface Water and Groundwater Matrices						
Petroleum VOCs	SW846 8021B	En Chem	14 days	3 vials/40 ml.	HCL (included in lab containers)	various
PAH	SW 846 8310	En Chem	7 days	amber glass/1 L.	none	various
Cadmium	SW846 6010B	En Chem	6 months	glass or plastic/500 ml.	none	0.37 ug/l
Chromium, Total	SW846 6010B	En Chem	6 months	glass or plastic/500 ml.	none	0.9 ug/l
Chromium, +6	SW846 7196A	En Chem	24 hours	glass or plastic/500 ml.	none	0.016 ug/l
Lead	SW846 6010B	En Chem	6 months	glass or plastic/500 ml.	none	3.6 ug/l
Mercury	SW846 7470A	En Chem	28 days	glass or plastic/300 ml.	none	0.021 ug/l
Total Organic Carbon	EPA 415.1	En Chem	28 days	glass or plastic/60 ml.	H2SO4 (included in lab containers)	N/A
Total Dissolved Solids (TDS)	EPA 160.1	En Chem	7 days	glass or plastic/100 ml.	none	N/A
Total Suspended Solids (TSS)	EPA 160.2	En Chem	7days	glass or plastic/200 ml.	none	N/A

N/A = not applicable

(1) Any container listed as "glass" should be made of borosilicate; any container listed as "plastic" should be of high density polyethylene.

(2) All lab samples must be cooled to 4C.

(3) Mercury volume can be combined with other metals volume as long as hold time is noted and observed.